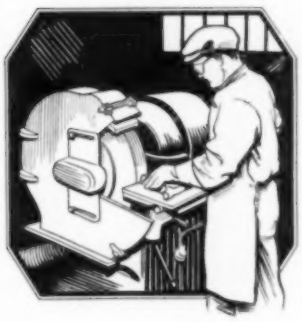
THE FOUNDRY

Established in 1892



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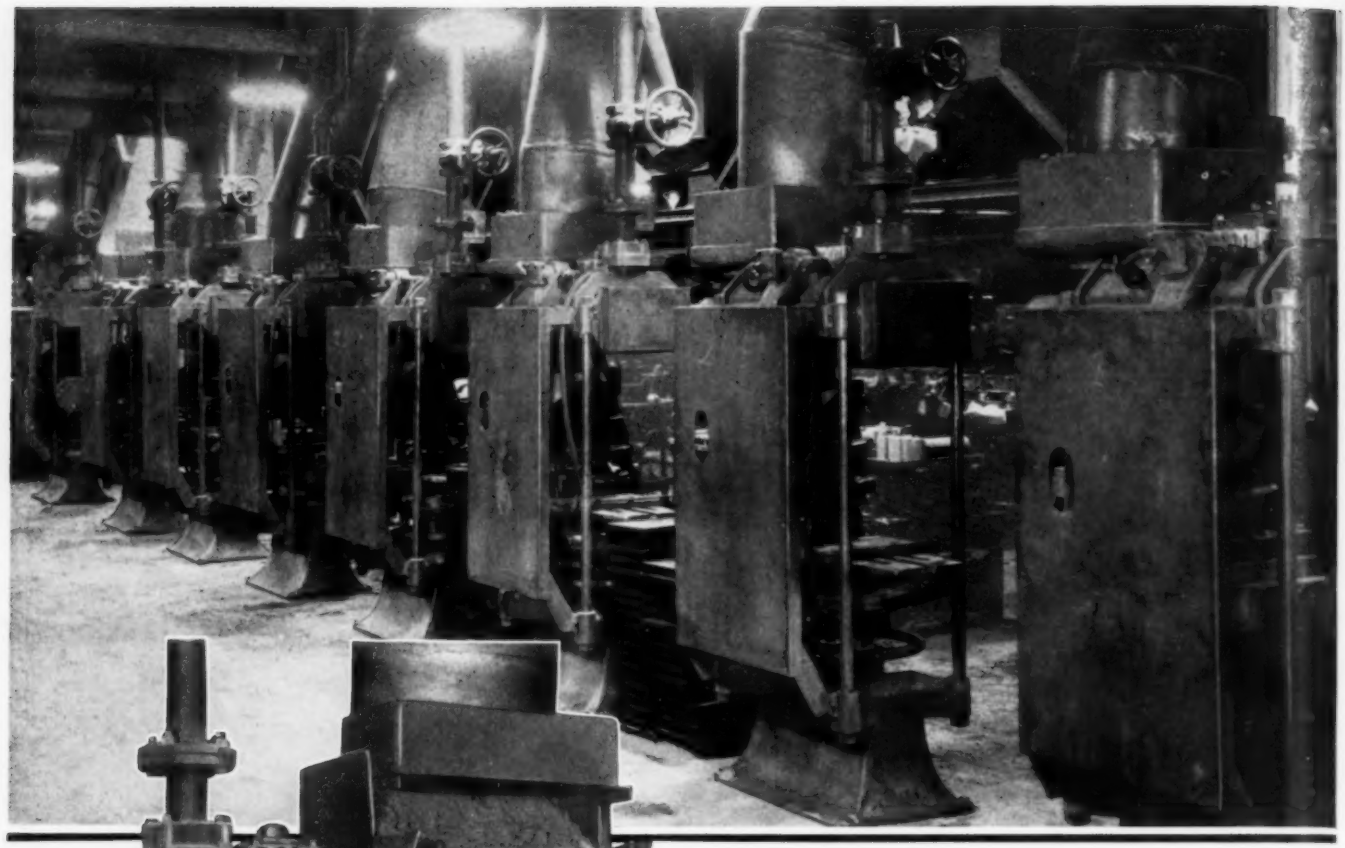
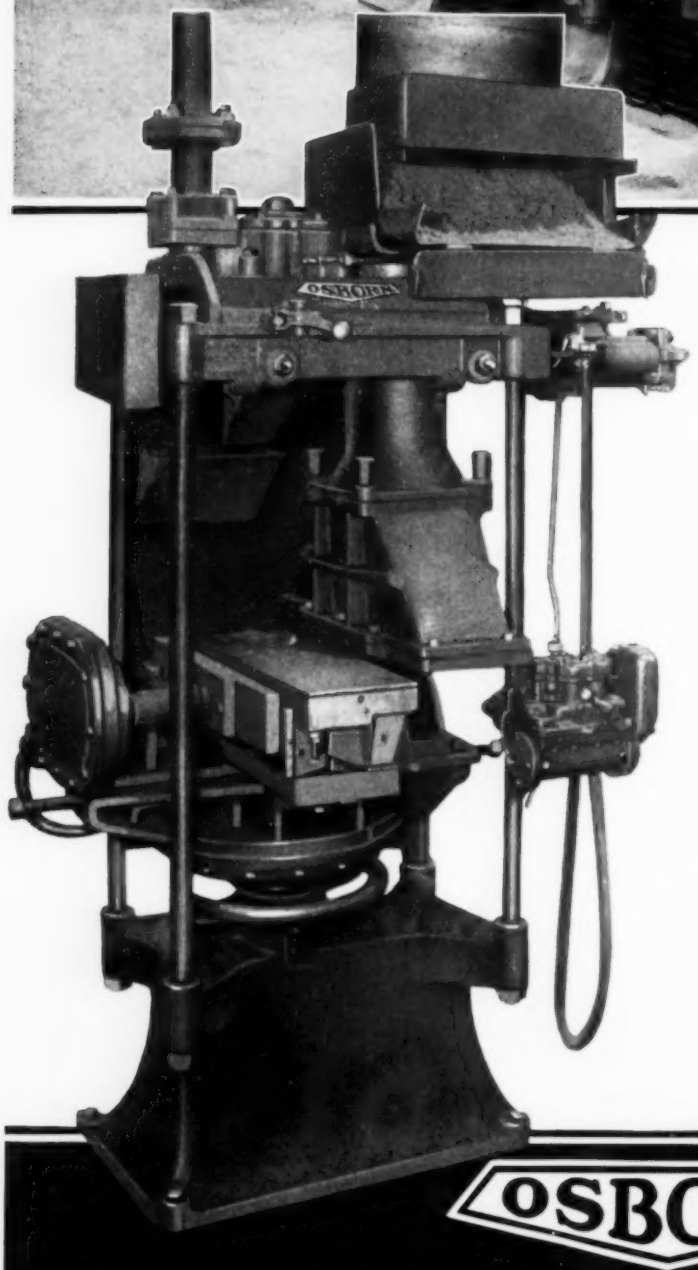




Battery

THE drive is on! Manufacturers are striving to give consumers greatest possible values at lowest possible costs.

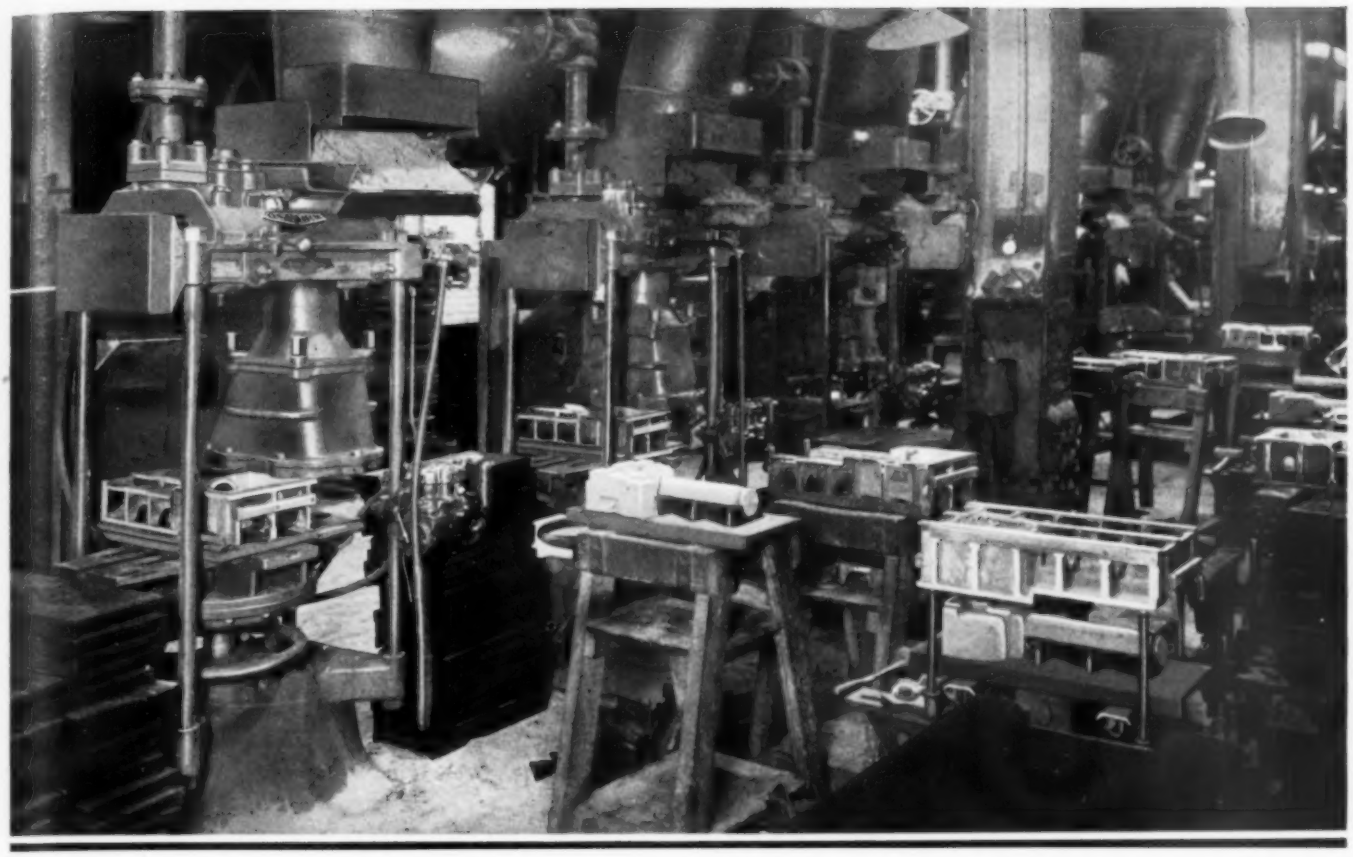
To do this, modernized equipment is essential. Costs must be minimized. Quality must be maintained or improved.

The photographs on these pages are significant. They were taken recently in the Dodge Bros. main plant of The Chrysler Corporation at Detroit, Michigan.

A battery of Osborn No. 92 Core Blowing and No. 36 Core Box Drawing Machines are producing better cores at higher speed and at lower costs.

Spring housing cores, port cores and cylinder

OSBORN



No. 92 *In Action!*

crankcase cores — all are produced on these machines. One valve controls all operations of the No. 92 Core Blowing Machine (illustrated at lower left of the opposite page). Its teammate, the No. 36 Core Box Drawing Machine, is illustrated at the lower right of this page.

The outstanding advantages of these machines merit the serious consideration of foundrymen seeking advanced methods of core making to meet present-day conditions.

Complete details will be gladly furnished upon request.

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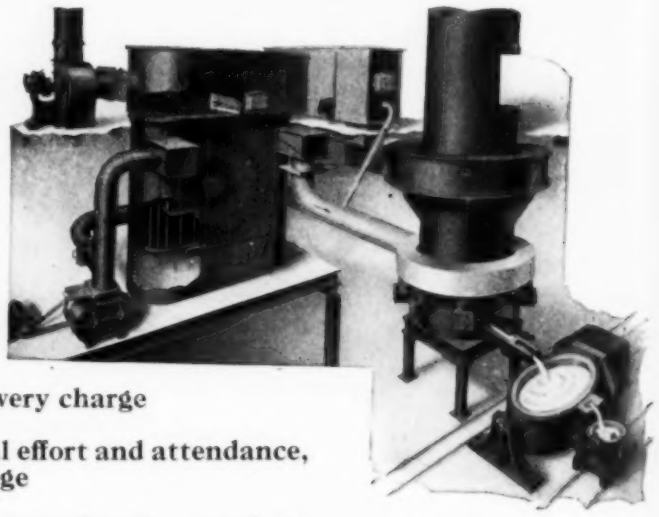


Over 25 per cent reduction in coke bills, 10 per cent increase in cupola capacity, and reduction in cupola maintenance expense.

Accurate cupola control and strict conformance of finished castings to predetermined analysis and exacting physical requirements

Safe inclusion of much more low-cost scrap in every charge

Simplified melting and pouring, with less physical effort and attendance, greater safety and minimized costs at every stage

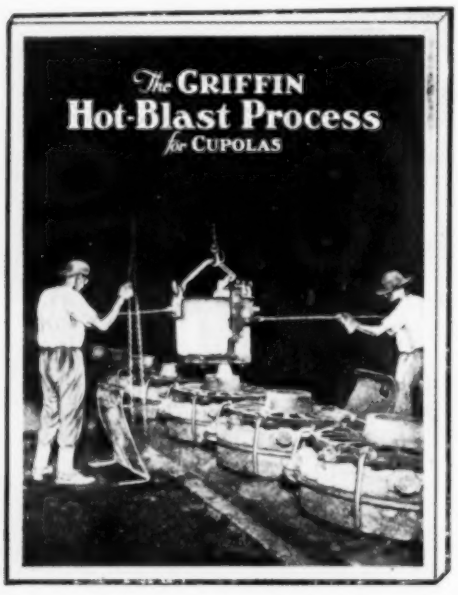
Easy and correct duplication of proper operating procedure in every heat

Standardized thoroughly uniform quality in large-volume production

Substantially reduced scrap losses

At least 50 per cent annual net cash investment return on the equipment.

The Griffin Hot-Blast Process accomplishes these *permanently sustained benefits* through improvement in cupola details, high-degree waste-heat recovery and utilization, continuous flow into a teapot-spout reservoir and mixing ladle for better desulphurization and slag removal, and by further slag removal and hot metal transfer to the moulds in bottom-spout pouring ladles.



Complete or partial conversion from cold blast to Griffin Hot-Blast does not interrupt production, and except for slight duct modification, fully utilizes all existing equipment. Performance improvement becomes fully effective *from the first day.*

Bringing and keeping equipment up to the highest production standard by means of the Griffin Hot-Blast Process is highly profitable even in a small foundry, and would make a very satisfying improvement in your annual balance sheet.

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The GRIFFIN
Hot-Blast Process

IF—

IF we could show you, on your own high speed grinders, the difference in grinding action between a 2 structure wheel and a 4 structure wheel of the same grain and grade, you'd know why Norton Bakelite snagging wheels are making such records . . . . are cutting snagging costs in many foundries.

It would be immediately obvious to you that the structure of the wheel—the spacing of the grains—has just as much effect on grinding action as grain size and grade (bond strength).

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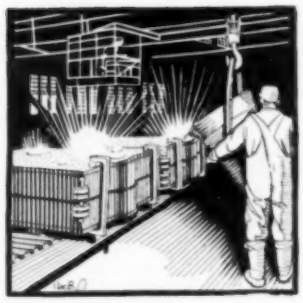


THE FOUNDRY for December

Good Plant HOUSEKEEPING

SAMUEL INSULL, model of business acumen until his failure to attain the impossible in finance, had an unfailing rule in appraising a property for purchase. He said, "look under the benches." Neatness and cleanliness were his unfailing measure for successful management of properties. A group of foundries in a midwestern city can meet this test. Through the slack period, men who otherwise would have been idle, have been given work in cleaning and rearranging the plants with which they have been identified. Walls, roof girders, cranes have been vigorously cleaned, washed and painted. Concrete floors and corner recesses have been freed from dirt, and appropriate bins, shelves and boxes have been provided to classify and contain the miscellaneous small items such as nails, gaggers, rods, tools, hooks and the thousands of sundries. Saving through conservation is an item these days. Avoidance of dust and debris is even more important as a byproduct of good foundry housekeeping.

Reduce Tax LOAD

EMPHASIZING the major importance of reducing governmental expenditures and relieving industry and agriculture of oppressive tax burdens, the National Founders' association at its annual convention, reported on page 17 has called for a public awakening. A resolution, unanimously adopted sets forth the attitude of foundry owners and will be followed by individual activity. An abandonment of special boards, bureaus, and departments in local, state and federal government is demanded. Reorganization where necessary, with the reduction in the number and salaries of unnecessary public employes comparable with the strictures laid upon business and industry is asked. A complete review and revision of administration covering the payments to veterans and dependents is urged. The tax menace through public and political extravagance cannot be over emphasized. Recovery cannot be effected until tax waste is eliminated.

Where Rust CORRUPTS

IDLENESS impairs equipment. Whether it be a tractor stored in the driveway of a farm shed, a machine tool carefully greased and shrouded, or a molding machine coated and covered, corrosion and dust take toll during idle periods. The extreme length of the period during which much foundry equipment has been in disuse will increase the depreciation. Many machines when again needed will be found impaired even with the best of normal idle care. The buyer of used equipment should bear this point in mind. Doubtless much sound, efficient, second-hand foundry machinery may be found to supply need for quick replacement in the more active times ahead. But thorough knowledge, careful inspection and test are necessary in buying. No manufacturers guarantee and immediate service provides insurance of satisfactory operation. The responsibility is assumed by the buyer when used machines are acquired.

What's New in NOVEMBER

TWO effective systems handle sand and molds in an electric machinery manufacturer's foundry, (page 12). From the depression of 1907 until the war THE FOUNDRY showed consistent advance, (page 15). Foundrymen consider means for relief from excessive tax burden, (page 17). Cutting the melting capacity of a 3000-pound furnace to 1000 pounds saves in operating costs, (page 18). Corrosion resistance important alike in steel and iron castings, (pages 25 and 36). New ideas, new methods and technical developments just over the horizon, (page 31). What European technical men offer of value to the foundry world, (page 62).

Fig. 1—Molds made on machines at the left are poured at the far end and shaken out at the station in the foreground

Handle Sand and Molds on Conveyors

Westinghouse foundry uses equipment to speed production of wide variety of iron castings

COMPACTNESS, flexibility, increased production and a reduction in operating cost are claimed for a mechanically operated sand and mold handling unit installed in the southwest corner of the foundry of the Westinghouse Electric & Mfg. Co., Cleveland. Mold conveyors and sand handling equipment accupy a space approximately 80 x 80 feet and inside this space 26 molding machines are operated at high speed on a wide variety of small and medium size castings.

Activities Grouped Close to Cupola

General layout of the installation is shown in Fig. 4, a free hand sketch, not drawn to scale. The large conveyor shown to the left, also all the sand conditioning and distributing equipment, shown in detail in the accompanying illustrations, were designed and fabricated by the Link-Belt Co., Chicago. The twin conveyors shown to the right were supplied by the Jeffrey Mfg. Co., Columbus, O. Workmen from the Westinghouse foundry assisted in the erection.

Activities are grouped close to one of the cupolas and near the cleaning room. In that manner the journey of the iron is shortened considerably from the cupola to the mold and from the mold to the tumbling barrel or sandblast. Monorail systems at both ends of the conveyor units facilitate movement of ladles and small pans or boxes which carry castings from the

Fig. 2—Hoppers carry sand from the flight conveyors to the molding machines

shakecut to the room where they are cleaned.

Under ordinary operating conditions the twin conveyors move constantly at a speed of 14 feet per minute, or a complete cycle in 19 minutes. They may be stopped and restarted as often as necessary. Each conveyor is actuated independently. A moving platform adjoins each conveyor for a distance of 30 feet. The speed of the platform synchronizes with that of the conveyor for pouring small molds with hand ladles. A different system is observed on the third, or single conveyor shown to the left in Fig. 4. Detail of that system will be taken up later in a description of the large unit.

Sand Supplied by Breeches Hopper

Each twin conveyor contains 43 plates or platforms, accommodating molds made on seven pneumatic squeeze machines supplied by the Osborn Mfg. Co., Cleveland. Position occupied by each battery of seven machines may be noted in Fig. 4. Arrangement of the breeches sand hoppers, springing from a common source at the top and extending to the right and left at the bottom, is shown in Fig. 2.

The circular pipe shown in the immediate foreground conducts overflow sand from the supply trough on top to an opening in the floor where the sand enters the moving stream from the shakeout and starts again on the cycle which carries it through the reconditioning apparatus.

General view of one of the twin conveyors with the shakeout grating in the right foreground is shown in Fig. 1. Molding machines are shown to the left with the right leg of the breeches hopper immediately above. This view also discloses that the conveyor is made up of a number of steel plates 2 x 4 feet, each plate mounted on a small four-wheel truck which runs on a double rail. Trucks are joined to each other by a modified type light steel draw bar and the entire ensemble is moved by an endless chain with projecting upward members which engage the bottoms of the trucks.

Some of the molds on that conveyor are made in snap flasks, but most are made in solid metal flasks, rolled steel welded, cast steel and cast aluminum. With the conveyor making a complete circuit every 19 minute period, it is apparent that only a small number of flasks are required as compared to requirements of a straight floor where the entire number of molds for the day is put up before the first one is poured.

Molds are shaken out as rapidly as they approach the shakeout station. They are comparatively light. Two helpers slide them from the conveyor and dump them on the shakeout grating. Sand falls through the grating, the empty flask is returned to the conveyor and the casting is lifted by a fork or hook and transferred to one of several steel pans or buckets. Each of the loaded buckets in turn is hooked to the chain of a monorail hoist and taken into the cleaning room.

Flasks Form an Elastic Link

Variation in size of molds loaded on the conveyor prevents each molder from receiving back his first flask, empty, the instant he places the last flask of his supply on the conveyor. A small reserve stack of flasks is kept near each molding station to take up slack, to bridge an emergency and in general to act as an elastic link in the chain of production. Some of the flasks arrive back before the molder has actual need of them. Others do not arrive until the supply on hand is almost exhausted.

Under ideal operating conditions and loaded to capacity each of the twin conveyors could handle 160 molds per revolution, that is in each 19 minute period. Allowing for three plates

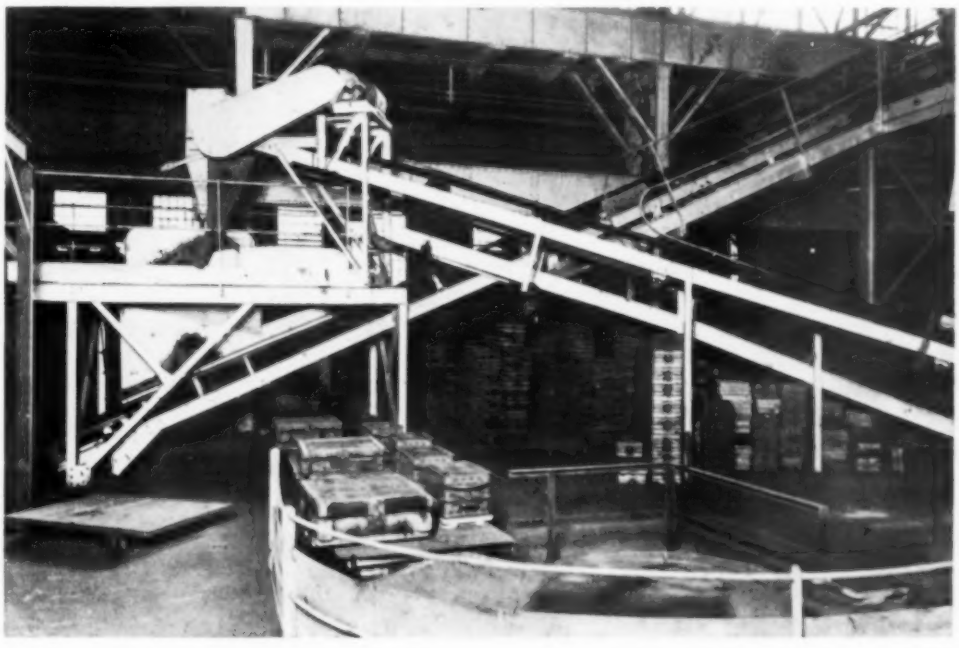


Fig. 3 — After passing through a disintegrating device the sand falls on a belt and is carried to the flight conveyors

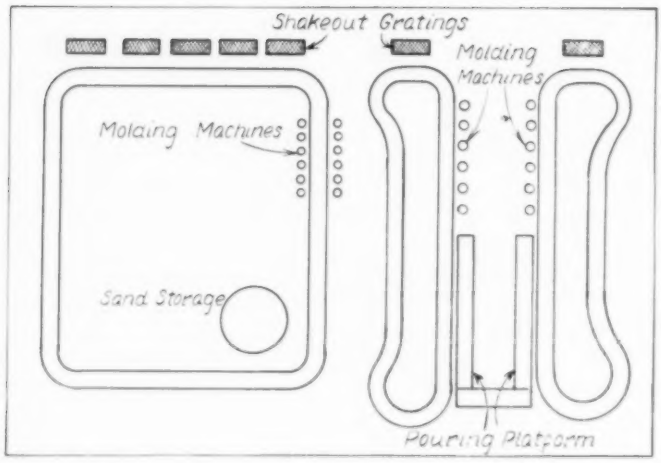


Fig. 4—General layout of conveyors, molding machines and pouring platforms

carrying empty flasks in the vicinity of the shakeout, and assuming that each mold contained 2 cubic feet of sand, or a total of 320 cubic feet it is apparent that a maximum of approximately four times that amount, or 1280 cubic feet would have to be kept in circulation.

Sand Kept in Circulation

Rammed green sand is estimated at 87 pounds per cubic foot or a total of 111,360 pounds, approximately 55 tons. Of the amount 25 per cent would be in the form of molds on one of the twin conveyors, while the remaining 75 per cent, would be occupying space in the hoppers, the main storage bin, the mixers and the various belts and flight conveyors. With both of the twin conveyors working, this estimate would have to be doubled.

The third or large conveyor, shown to the left in Fig. 4 and shown in part in several of the other illustrations is made up of 35 plates or tables 36 x 72 inches. It was designed to handle a more diversified line of molds than that handled on either of the twin conveyors. Molds are made on 12 combination jolt and squeeze machines arranged in two groups of six, one group inside the conveyor line and one on the outside. Within practical operating limits the large molds are made on machines located in the outside line, while smaller molds are made on the inside.

A wide variety and supply of flasks, jackets and bottom boards, is kept on hand inside the rectangle bounded by the four walls of the conveyor. This feature is shown quite clearly in Fig. 3, an illustration made primarily to show construction and method of operation of the final tempering belt, revivifier and main cross belt conveyor of the sand handling system.

The open space inside the rectangle has been utilized farther by erecting the main sand storage tank or hopper near the northwest corner. Horizontal driving sprocket which actuates the conveyor table is located at the southeast corner and idler sprockets occupy space inside each of the other three corners. One is shown in the foreground of Fig. 3.

Plates or tables in this conveyor move over a set of fixed horizontal rollers. These rollers, each in two short sections, are mounted radially at the corners and at a right angle to the line of travel on the straight sections of the conveyor unit. Each plate is attached to the conveyor chain by a vertical pin depending from the inner forward corner. Thus each plate is independent of its neighbors, but is held in an approximately fixed relationship by the chain connection by which it is driven.

Conveyor Is Controlled Automatically

It is claimed that in this type of conveyor the friction is reduced to a minimum and that the load on the driving motor is reduced to a gratifying extent. Movement of the conveyor is controlled automatically and may be set to function within widely varying time limits. In this particular instance the timing device is set for a 5-minute cycle. Thus the entire conveyor table remains stationary for 4½ minutes. Theoretically, tables immediately in front of the molding machines are loaded by that time. The conveyor then is set in motion and travels through a distance of 30 feet, or sufficient to move the loaded tables into the pouring zone, and to bring five empty tables in front of the molding machines for another load.

Plates remain in front of the shakeout station for one period, in front of the molding machines for one period, at the pouring station for one period and in the cooling zone for four periods. That arrangement has been found ample for comparatively light (*Please turn to page* 56)

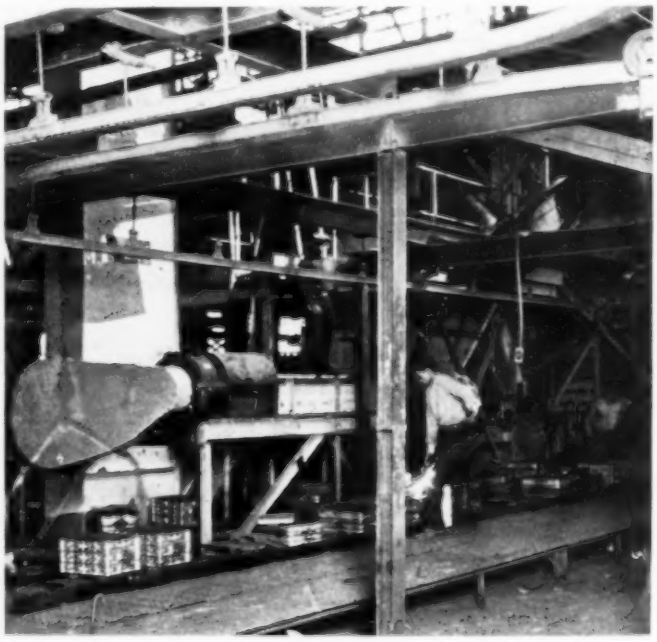


Fig. 5—A traveling platform is provided for pouring small molds on the conveyor

Through the Years with

ACTIVITY in the foundry industry during the period from 1908 to 1914 is a good representation of one of the so-called seven year cycles that so often are referred to today in the discussion of business conditions. The latter part of 1907 witnessed a period of extreme financial stringency which held into 1908. In January, 1908, THE FOUNDRY estimated that not more than 50 per cent of the foundry producing capacity was operative, and that plants not closed were operating only four or five days a week.

Recovery a Slow Process

During the fall of 1908 business began to increase gradually and during 1912 and 1913 reached a peak which best may be illustrated by reference to an editorial which appeared in the February, 1912 issue of THE FOUNDRY stating that steel plants were operating from 75 to 80 per cent of capacity, gray iron shops specializing in automobile work were running double shift and the brass shops and aluminum foundries were equally well engaged. Great activity in the foundry industry continued through the early part of 1913 and then began to decrease. That condition continued through the year 1914. While it had been confidently expected that the latter half of that year would show an increase in business for the foundries, the outbreak of what then was termed the European War in August, 1914 upset trade conditions and delayed the recovery.

During the period from 1908 to 1914 inclusive statistics gathered by THE FOUNDRY showed that there was a total net increase of 141 foundries, but the comparative two year periods show that the increase or decrease in one of those periods is an extremely variable figure. For example, from 1908 to 1910 there was an increase of 226 foundries notwithstanding the business depression in existence at that time. However, the two following two-year periods of 1910 to 1912 and 1912 to 1914 showed losses of 54 and 31 foundries respectively.

While molding machines had been introduced some time before 1908, installation of those labor saving devices had proceeded at an extremely slow rate. However, slow business conditions existing during 1908, 1909, 1910 and the early part of 1911 made it necessary that production costs be reduced, and more foundrymen began to investigate closely the possibilities of molding machines. THE FOUNDRY aided this plan through publication of many articles on molding machines. The result was that numerous installations of such machines were made with other modern foundry equipment so that in general the foundry equipment manufacturer enjoyed a profitable period even though the foundry business in general was slack.

Lack of knowledge of foundrymen in general to the actual costs of making castings was stressed by THE FOUNDRY through the publication of many articles describing cost accounting systems, ranging from simple ones applicable to small foundries to extremely elaborate systems for those of the largest type. Conditions today do not seem to have changed a great deal from those of the 1908 to 1914 period, as much of the difficulty encountered in the foundry industry at present is attributed to the fact that many foundrymen have no idea what it costs to manufacture castings in their own shops.

Statuary Molding Holds Attention

Considerable interest was being displayed in the casting of nonferrous statuary and ornamental work, particularly in 1909, 1910 and 1911 and THE FOUNDRY presented numerous articles by noted authors describing the methods employed.

Manufacture of gray iron castings in metal molds is a process that has attracted the attention of foundrymen for a considerable period. While many of the problems involved now have been solved, considerable development work had been done previous to 1908. In May and September of that year Edgar Allen Custer, who was the first to employ iron molds to any extent, presented articles in THE FOUNDRY describing the methods used. Those articles were followed by others in 1909 and 1910 by the same author

giving extensive information upon the procedure to be employed when metal molds are used.

March 1909 issue contained the first article of a series of twelve by Dillon Underhill on enameled cast iron sanitary ware, which described in detail the production of bath tubs, water closets, sinks, etc., from the manufacture of the patterns to the crating of the finished product. J. Kent Smith, now noted for his investigations on the effects of molybdenum on cast iron, was author of an article in the February 1909 issue of THE FOUNDRY upon the effect of vanadium on cast iron which shows that the study of the effect of additional elements was not neglected at that time. In December, 1909 Pat Dwyer now engineering editor of THE FOUNDRY joined the contributors with an article entitled "A Simple Device for Making Gears with a Segment Pattern."

Follow Developments Closely

In keeping its subscribers acquainted with the latest developments in the foundry field, THE FOUNDRY in the June 1909 issue described a power ramming machine developed at the Ferguson & Lange Foundry Co., Chicago, and which employed a vertical belt conveyor with cleats fastened at regular intervals. The belt operating at high speed caused the sand to cling to it until the bottom pulley was reached and at that point the sand was thrown at high velocity into the flask. One development that appeared to have promise was described in the April 1910 issue and consisted of casting aluminum gas engine cylinders around cast iron liners. The finished cylinders weighed less than one-half of those made wholly of cast iron, but apparently the higher cost of aluminum militated against general acceptance at that time.

A novel method to ascertain the extent of internal strains in cast steel locomotive cylinders was described in the March 1909 issue. The test consisted of firing projectiles at the cylinders. Powder charges of 3 and 6 pounds were used in the tests, and according to the results obtained there was no evidence of any internal strain in the castings. The search to lower the time required for annealing malleable castings is not new and that amply is illustrated in an article in the June 1908 issue containing description of a malleable foundry where it was claimed that with the type of annealing oven in use, castings were annealed satisfactorily in three days.

Automobile production in 1910 according to the present standards was a mere bagatelle. For example, in the June issue it was estimated the automobile manufacturers would produce the staggering number of 200,000 cars for that year. The largest figure for any one manufacturer at that time was 40,000 cars, and the Ford Motor Co. which was second was listed for 30,000 automobiles. In an effort to exceed the estimated yearly output the Ford company in one day shipped the unheard number of 212 cars. Of the 31 firms manufacturing motor cars in Detroit at that time only six names now are familiar and they include Ford, Cadillac, Packard, Hupp, Hudson, and Paige which now is known as the Graham.

That THE FOUNDRY, then as now, was the outstanding publication in its field— is indicated in the October 1910 issue in an announcement that THE FOUNDRY had purchased the *Foundry News* which was published in New York. It was stated that of the paid-in-advance subscribers to the *Foundry News* there were only nine that were not already readers of THE FOUNDRY. The editorial went on to say "Nor was this due to any lack of enterprise on the part of the owners of this publication. The campaign for circulation was carried on energetically and intelligently and the cost per subscriber was prodigious. Yet after all this effort and expenditure, after veritably scouring the North American continent for readers, only **nine** were found not already subscribers to THE FOUNDRY. This again emphasizes what we have always claimed—that THE FOUNDRY is the foundrymen's textbook and is pre-eminent in its field."

Though the term semisteel usually indicates that the material is gray iron produced through the use of scrap steel in the cupola charges, another meaning was given to that term in an article in the January 1908 issue of THE FOUNDRY. The article described a material called McHaffie steel which was made from special grades of imported white and mottled pig irons melted in the cupola. The molten iron was poured into green or dry sand molds and the resulting castings were annealed which was said to convert them into a semisteel.

Heated Molds Not New

Use of hot molds to gain certain advantages not possessed by green or dry sand molds is an ancient process. It was briefly and interestingly described in an article upon thin Chinese castings which appeared in the May 1912 issue of THE FOUNDRY. The castings referred to are extremely thin walled pans of large diameter and used for cooking food in China. The pans are made in clay molds which are heated to almost a white heat before the molten metal is poured in. The castings were gated in the center, and the gate had to be sawed off carefully to prevent breakage.

In furthering the knowledge of its readers, THE FOUNDRY in July 1910 presented a paper containing extensive lists of analyses for various types of castings which were the averages of information obtained from all over. In August 1913 results of an investigation of cupola melting operations, conducted at the bureau of mines and which did much in eliminating the mystery of cupola operation, were presented.

E. B.

Consider Taxation and Legislation

Characteristics and control of silicosis discussed at New York meeting of N.F.A.

WITH a courageous, but somewhat apprehensive eye on the business weather vane, foundrymen vigorously attacked their economic problems at the thirty-sixth annual convention of the National Founders association, held at the Waldorf Astoria, New York, Nov. 16-17. Special attention was directed to taxation and federal legislation and to measures designed to further the slight improvement in business. Personnel questions engaged considerable discussion and the greater portion of one session was given over to the subject of "Silicosis in the Foundry."

S. Wells Utley

Thomas W. Pangborn

While the association showed a loss in membership, the report, as president of A. E. McClintock, commissioner, was considered good in view of the times. A sound financial position also was indicated. Registered attendance was comparable with that of a year ago.

An eloquent defense of the American system of freedom of enterprise, miscalled, he said, by its enemies, the capitalistic system, was made by S. Wells Utley, Detroit Steel Casting Co., Detroit, in his presidential address. By virtue of this system, whereby the individual is spurred to achievement by prospects of adequate reward, this country in 147 years has become the strongest and the wealthiest nation in the world.

Under this system, the speaker asserted, society has so organized itself that when any man, be he laborer or capitalist, strives in a legitimate manner to advance his own interests by the production of more than he consumes, the major part of the benefit comes not to himself, but to society as a whole. Such system, he declared, was essential to the future well-being of the country.

Comparing the socialistic system with the so-called capitalistic system, President Utley declared that the great problem of civilization is not primarily the distribution of its present wealth, but the continued production of new wealth. Otherwise succeeding generations will have no wealth to divide. Asserting his belief that federal taxation has reached the saturation point, James A. Emery, Washington, counsel of the association, stressed the need for drastic curtailment in government expenditures. One of the greatest steps to this end, although difficult because of its political aspects, would be in the restriction of expenditures paid out for nonservice disabilitation of veterans. He cited the absurdities arising from these expenditures, and warned that the trend was toward a still heavier burden in that direction, unless tremendous pressure was brought to bear on congress by taxpayers. The entire purpose of the original plans for veteran compensation has been changed and expanded by political self seekers. Non-service disabilities and free hospital service add to the burden.

He warned against certain measures likely to come up before congress this winter, and condemned government competition with private enterprise. He points to evils which may arise as a result of the gov- (*Please turn to page* 57)

Redesigns Electric Melting Furnace

Changes reduce electrical charge and permit pouring metal five days a week

By RALPH R. WEST

West Steel Casting Co., Cleveland

NECESSITY long has been quoted as the mother of invention. Some time ago the need of pouring steel in varying amounts on five days a week schedule led the engineering department of the West Steel Casting Co., Cleveland, to search for a means of solving certain difficulties in connection with the melting medium. Facts regarding the needs of the company were obtained easily and revealed the following:

Must Operate Five Days

1. Pouring five days a week was an absolute necessity to keep the casting business then on hand.

2. It was necessary to reduce the electrical charge through longer operating time and increased load factor, since longer operating time at reduced load brings the standby charge down. This holds good on all power contracts known to the author, providing the large furnace is not operated in demand setting period.

3. A more efficient plant was a desirable objective, and this could be obtained by working every day with a small group comprised mostly of foreman and key men.

4. The varied analysis now required, much of which is in smaller lots than previously melted, also presented a problem. Some customers desired low carbon, some S. A. E. alloy steels, and others steels of a stainless type. All of these problems had to be met.

Facts showed clearly that the company needed a much smaller furnace than the 3000-pound per hour unit then in use, which was supplied by the Pittsburgh Electric Furnace Corp., Pittsburgh. The desired size would melt approximately 1000 pounds per hour. The cost of a furnace of that size was determined, but the purchase was considered unwarranted at that time. Also the bleeder type unit was considered, where a small shell and complete control is set up from the present substation, but this was considered too great an expenditure for a temporarily unsettled condition of business.

Reduce Size of Furnace

Since the factors of cost militated against purchasing of such equipment, other means were investigated, and the company secured facts concerning the changing of one of the 3000-pound per hour furnaces to a smaller type. This was to be accomplished with the least possible expense. At the same time nothing was to be destroyed that could not be replaced in 36 working hours by a mechanic and helper. The cost of the furnace changes were as follows:

Roof	$25.00
Roof ring (scrap flask)	1.50
500 clay brick	10.00
3 coolers	15.00

Detailed Comparison of Metal Costs On Two Sizes of Furnaces

Furnace	No. Heats	No. Men	Working Hours	Total Demand	K.W. Used	Standby Charge Furnace	Furnace Demand	Labor Cost	Material Cost	Supervising	Total Cost	Cost Per Lb. (cents)	Steel Poured (pounds)
1	8	4	40	11	3610	$18.00	7	$15.40	$88.33	$15.00	$173.45	1.40	12,310
2	3	4	24	16	3640	$32.00	12	$12.38	$72.84	$15.00	$168.64	1.39	12,120
1	6	5	45	11	2740	$18.00	7	$17.10	$63.37	$15.00	$141.87	1.53	9,150
2	3	4	33	14	3600	$26.50	10	$11.36	$54.14	$15.00	$143.00	1.50	9,510
1	6	4	36	11	2850	$18.00	7	$13.74	$76.05	$15.00	$151.29	1.61	9,360
2	3	4	33	16	3230	$32.00	12	$12.72	$79.99	$15.00	$172.01	1.66	10,310
1	2	3	17½	11	1160	$18.00	8	$ 7.20	$30.74	$15.00	$82.54	2.38	3,460
2	1	3	10	12	1540	$26.00	8	$ 4.12	$18.91	$15.00	$79.43	2.58	3,070

Average for Month of May, 1932—1.48 cents per pound operation on No. 2 Furnace.

3 electrode-holders	150.00
Copper stripes for electrode arms	25.00
Bolts, nuts, etc.	10.00
Labor	150.00
Rewinding transformers (current)	15.00
Miscellaneous	25.00
Total	$426.50

The cost of labor ran a little high due to the fact that working drawings were not provided and the various problems were considered as they developed during the changing operations.

The present transformer has a rating of 1250 kilovolt-amperes. The high side comes in at 11,000 volts and is reduced to a high and low voltage of 215 volts for the high and 130 volts on the low, normal 60 cycles. The normal impedence of the transformer is 11.8 per cent.

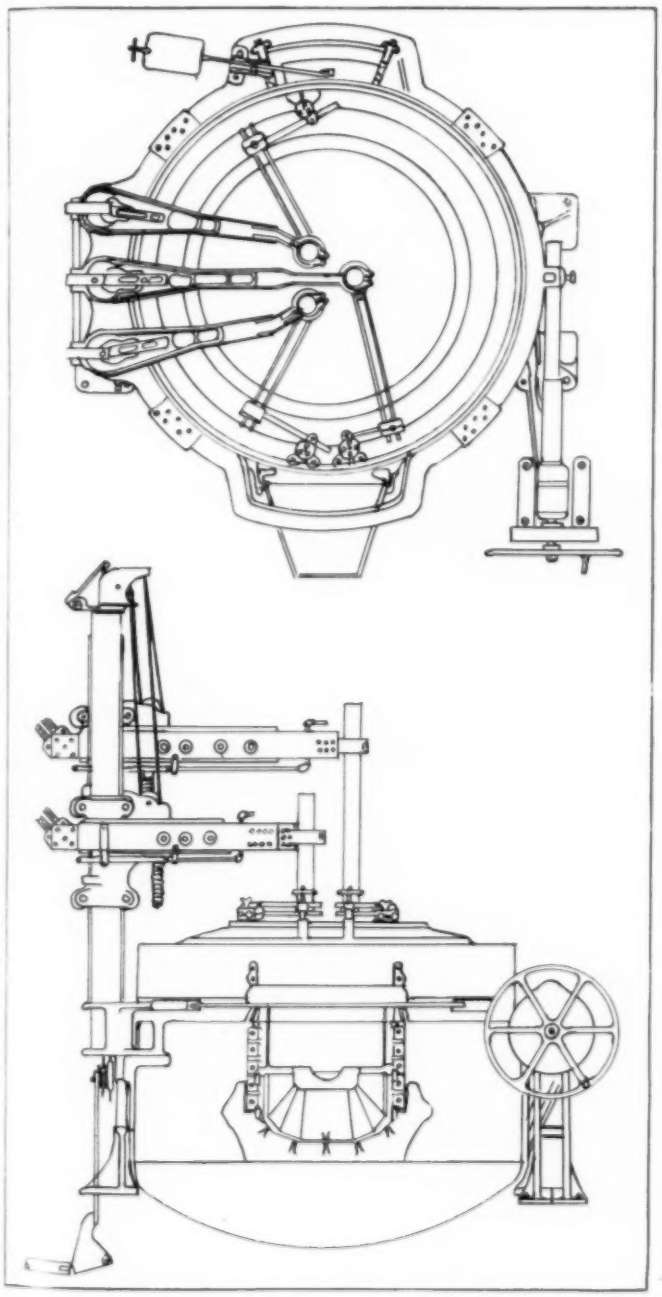


Fig. 1—Arrangement of the electrode clamps on furnace after changes

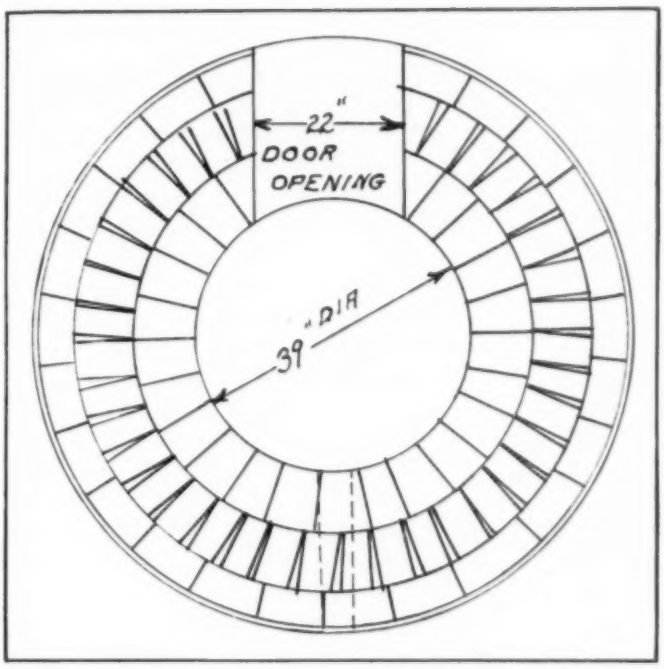


Fig. 2—Method of lining. A ¾-inch layer of insulating cement with molasses water as a binder is rammed between the brick and shell

The following changes were made in the furnace:

1. Three current transformers on secondary leads were changed from an ampere rating of 400 to 5 to one of 1500 to 5.

2. The voltage for operating on open circuit was lowered to 194 volts on the high tap. Ninety-five volts were used open circuit on the low tap. The reactance of 22.3 per cent on the high and 18.9 per cent on the low was thrown in. This reactance is inside the transformer but is in addition to the normal impedence of the transformer.

3. Eight-inch electrode clamps were removed and replaced by 4-inch clamps, which were spaced on proportional arc diameters. This change required that the copper strips be bent and drilled to bring the 4-inch electrode holders in so as to maintain proportional diameters. Also the copper strips of the center electrode arm had to be bent in to allow clearance for the two outside arms, as may be noted in Fig. 1.

4. Carbon coolers on the roof were changed from 8-inch to 4-inch.

5. The furnace was relined to a diameter of 40 inches by using converter brick with a backing of double clay brick as shown in Fig. 2.

The cost of operating the small unit as compared with a unit of larger size probably will be shown best by the furnace cost records taken from the daily cost report as shown in the accompanying table. These costs are not exact as far as fixed charges are concerned, but may be considered comparative. The field of the small furnace is below a daily pouring of 7000 to 9000 pounds. Be- (*Please turn to page* 52)

Deoxidizers for Brass Alloys

Phosphorus used extensively in the manufacture of red and yellow brass

By CHARLES VICKERS

PHOSPHORUS, manganese, aluminum and silicon are elements used chiefly for deoxidizing brass and bronze alloys. Each has a sphere of usefulness in removing certain oxides from the metals, which are either sublimed or skimmed off before pouring the brass, leaving the metal purified of deleterious substances and improved in strength or density.

Each of the elements mentioned can be used either for alloying or as a deoxidizer. When used for the latter purpose, only a trace of the purifying element may be detected by analysis, yet it leaves evidences of work accomplished. When the substance is used for alloying purposes, it does not act as a deoxidizer. For example, aluminum in certain percentages with copper forms aluminum bronze.

While the copper has been deoxidized by the aluminum, the cuprous oxide in the copper merely has been converted into aluminum oxide, which is a more deleterious substance than the cuprous oxide. The latter could have been removed by some deoxidizer that might have left no trace of oxides, whereas, the alumina cannot be removed by ordinary deoxidizers.

Must Remove Its Oxide

There is no doubt that a deoxidizer for aluminum bronze would be useful, particularly if it would remove its own oxide after reducing alumina, but there appears to be no such element available. That is one reason it is so difficult to obtain pressure castings of aluminum bronze. The only way is to make the bronze so carefully that no oxide, or at least very little of it, will be left in the metal.

The term fluidizer may be applied to some of the elements also used as deoxidizers. Phosphorus is a fluidizer, but not in the same way as silicon and aluminum. The latter element in certain alloys lays a tread over the sand mold, thus providing a smooth road for the metal filling the mold. Phosphorus on the other hand causes the molten alloy to penetrate into the sand. Unless the mold is protected as will be described later, the metal must be poured cool.

In making castings of phosphor bronze, which is merely a bronze containing so much phosphorus, that the latter becomes an alloying element instead of being used as a deoxidizer, it is best to make the molds in dry sand. Skin drying is not satisfactory, and the molds should be baked in the oven over night. Plumbago wash should be painted on the molds before they are dried. Molds should be made of a mixture of half old and half new sand with one part flour to 20 of mixed sand, using a No. 1 or 2 grade of good molding sand. When such molds are painted carefully with creamed plumbago in molasses water, and thoroughly dried, they make nice phosphor bronze castings.

Tin was considered a semiprecious metal in

Elaborate precautions are made to catch the proper pouring temperature when pouring a highly phosphorized half yellow brass

brass foundries 35 or 40 years ago so it never was used when something else could be substituted. The substitute most generally used was phcsphorus which was added in the stick form. In making an alloy of phosphor bronze containing 0.8 per cent or more phosphorus, it was necessary to add 7 pounds of stick phosphcrus to a pot of metal containing 300 pounds of bronze, resulting in considerable danger from fire. Even more difficulty was encountered in adding phosphorus to a yellow brass.

Pouring a highly phosphorized half-yellow brass differs considerably to pouring an alloy such as 80 per cent copper, 10 per cent tin, 10 per cent lead and probably 0.7 per cent phosphorus. The yellow alloy is much more lively, and takes longer to cool to pouring temperature. That temperature is easy to miss, in which case the metal must be returned to the furnace. The metal also is likely to solidify, and on remelting, break the pot. Thence, elaborate precautions are made to catch the proper pouring temperature. The metal may be cooled down with addition of sclid metal, but that must not be overdone. The same holds true with a 80-10-10 alloy. Of course when the temperature is measured by a pyrometer, and the exact point at which to commence pouring is known, the metal can be ccoled down by gates until that point is reached, when the molds can be poured without delay.

May Cause Dirty Castings

Putting in a little silicon-copper in phosphor bronze will quiet the metal and make it easier to cast. However, machining will show that this is nct a good idea, because of the dirt that will be uncovered. To get good castings, pour at a low temperature. If not certain of getting the correct temperature, pour on the cool side but pour into dry sand molds coated with plumbago.

On numerous occasions, the author, through the Question and Answer department of THE FOUNDRY has recommended the addition of approximately 1½ cunces of phosphor copper to each 100 pounds of metal. Practical tests have shown such suggestions to be correct. Some founders might assume that amount of phosphor copper is correct in all cases for small castings. While it is nearly right in the case of all metals of the ounce class, it errs on the side of excess in all metals that touch on the yellow class.

Ounce metal is an old alloy originated, it is understocd, in Scandinavian countries and consists of one ounce each of tin, zinc and lead to each pound of copper. It has become a favorite with modern founders of red brass, but it is modified cften by changing the zinc to 6 per cent, and the tin to 4 per cent. Sometimes the lead in changed to 6 per cent, the tin to 4 per cent and the zinc remains at 5 per cent. The latter are known as modified ounce metal. Another modification consists of the straight 85, three fives ingot, to which 3 pounds of lead is added to each 100 pounds. This is not done for the sake of cheapness, but because it is a good metal for small valves designed to resist moderate pressures. Frequently where the modified alloys cf ounce metal have failed to resist pressures in the case of small valves, the addition of 3 pounds of lead to 100 pounds of the alloy has solved the problem easily.

It is customary in phosphcrizing the metal from the electric and other noncrucible furnaces that pour off with ladles, to use a little measuring cup, calculated to hold one ounce of small shot or pounded up phosphor copper. The deoxidizer is scooped up with the cup and tossed into the bottom of the ladles. Then the brass is poured into it and melts and mixes the deoxidizer throughout the metal. This method is practiced almost universally, and it is quite satisfactory in this and similar alloys.

Less Phosphor Copper Used

A different procedure should be used for plumbing supplies such as faucets, bath cocks, and similar castings. While the metal used for that purpose is different from the ounce class, it is alike in that it will produce leakers just as readily as the ounce metal that is not treated with lead. Therefore, it must be phosphorized but it is important that the same amount of the deoxidizer is not used.

A number of years ago many plumbing castings were made of an alloy of approximately 83 per cent copper, 10 per cent zinc, 4 per cent lead, and 3 per cent tin. In 1907 Erwin S. Sperry claimed that the use of new metals for the manufacture of cocks and faucets, would be suicidal, as far as profit to the manufacturer was concerned. When for some reason new metal had to be used, he recommended the 10 per cent zinc alloy previously mentioned, as that was the average compcsition of faucets and the general line of plumbing goods.

Metal used largely in plumbing shops today is made by mixing various proportions of yellow brass ingot with a less proportion of red brass ingot. One such mixture is comprised of two-thirds yellow ingot and one-third red brass, or ounce metal. Such a mixture may have an approximate analysis of 71 per cent copper, 24 per cent zinc, 31 per cent lead and 2 per cent tin. That is a suitable alloy for general plumbing castings, but it will not stand the addition of as much as 1 or 2 ounces of phosphor copper per 100 pounds of brass.

Numerous brass founders have claimed that one ounce of phosphor copper per 100 pounds for that style brass, which is really a yellow brass, causes porous castings. (*Please turn to page* 53)

Loam Mold for Large Steel Casting

Requires study of design, pattern equipment, molding and pouring methods, gates and risers

By H. V. FELL
Sheffield, England

BEFORE the mold described in the November issue of THE FOUNDRY was taken apart the various sections were marked in a suitable manner to facilitate putting them together again. The cope was removed and set up on temporary stands where it was finished, nailed and the surface painted in the usual manner.

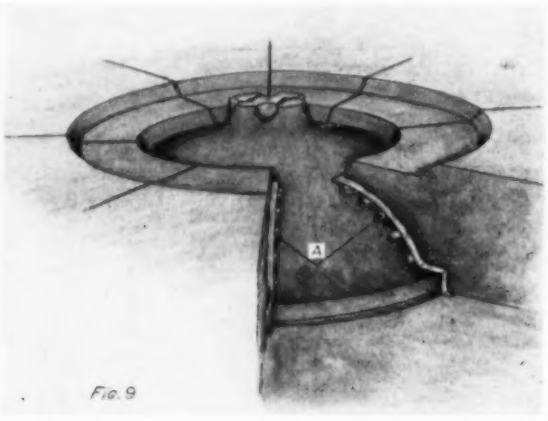


Fig. 8—Shape of the finished casting. Fig.9—Pieces of thin steel closing open spaces left by the dividing boards are supported by spring chaplets as shown at A

The division boards were pulled from between the drawbacks and the drawbacks were removed one at a time and placed on cars which later conveyed them into the drying ovens. Turnbuckles attached to the crane chains enabled the molders to adjust the weight of the drawbacks in a manner to ensure a level lift.

The mound of sand forming the bottom part of the mold was dried in the position it occupied. A number of pedestals were erected on the flat parting at the bottom, the floor which supported the drawback plates, and the cope was lowered into place until it rested on the tops of these pedestals. The space then was enclosed in metal sheets and fire baskets were placed at strategic intervals. Later, four streams of hot air were driven down through the four riser openings from portable type driers located on top of the cope.

In reassembling the mold, each of the drawbacks was fitted separately into place. Balls of soft clay were placed at several points on the sand dome before the drawback was lowered into place. The drawback then was removed temporarily and the clay balls examined to note the thickness. If necessary a slight adjustment was made in the position of the drawback on its final return to place.

The open spaces left by the dividing boards between adjoining drawbacks were closed at the bottom by pieces of thin sheet steel supported on spring chaplets as shown at *A* in Fig. 9. Sand then was rammed in the crevices between the draw-

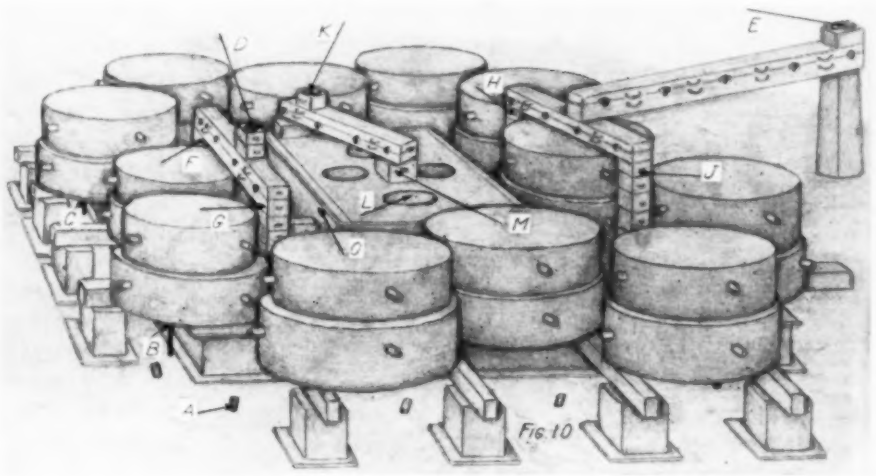


Fig. 10—Mold ready for pouring showing vent pipes, runner basins, binder beams and weights

backs. Vent pipes indicated at *A* in Fig. 10 were connected to the vents leading from the bottom of the mold and then the space behind the drawbacks was filled with rammed sand.

As a precautionary measure in placing the cope, ½-inch thick metal strips were placed on the girders and small clay balls were placed at various points on the joint. After the cope had been lowered, it was hoisted again and the flattened clay balls were scrutinized carefully to note if the cope bore down unduly at any point. Satisfied on that point, the molders removed the clay and the ½-inch packing pieces and the cope was lowered into place permanently, which in the case of a mold means until the mold has served its purpose in giving shape to a certain volume of metal.

Binder beams were placed on top of the cope and bolted down through long bolts attached to the binder bars under the bottom of the mold. Two of these bolts may be noted at *B* and *C* Fig. 10. Additional beams then were adjusted in place and circular weights to the extent of 230 tons were distributed over the top of the cope as shown in Fig. 10. Several long, narrow flasks and a number of small rectangular flasks were pressed into service to form the heads and runners. The completed ensemble as it appeared ready for the metal is shown in Fig. 10.

Metal Poured from Three Ladles

To obtain a heat gradient as uniform as possible during the casting operation, the metal was supplied in three ladles. No. 1 contained 24 tons and was provided with two 2-inch nozzles. The reader will note that the runner basins *D* and *K* in Fig. 10 were arranged to coincide with these two nozzles.

No. 2 ladle contained 10 tons of steel and was provided with a single (*Please turn to page* 54)

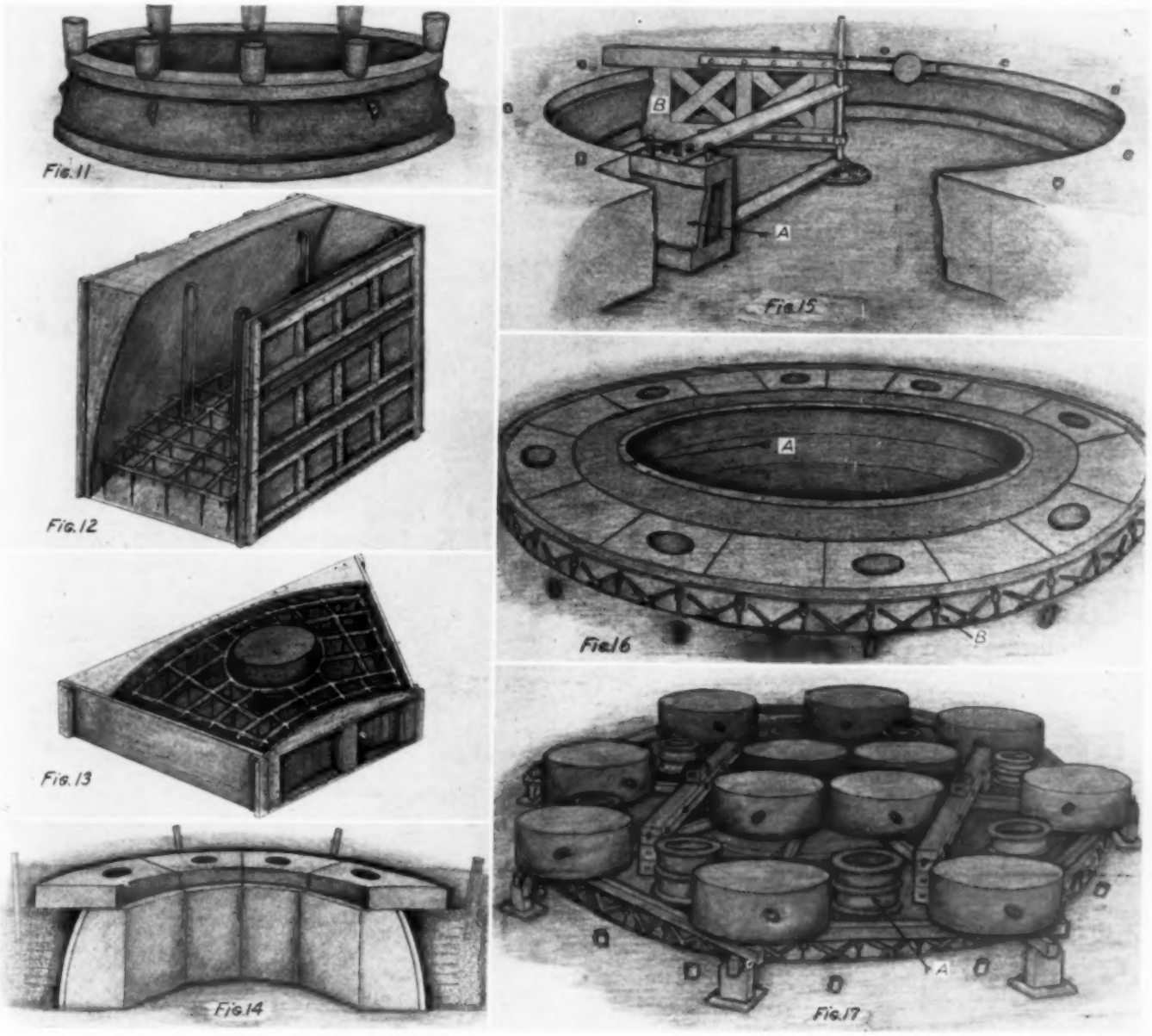


Fig. 11 to 17—Various steps in making the mold and cores for the casting which is shown in Fig. 11

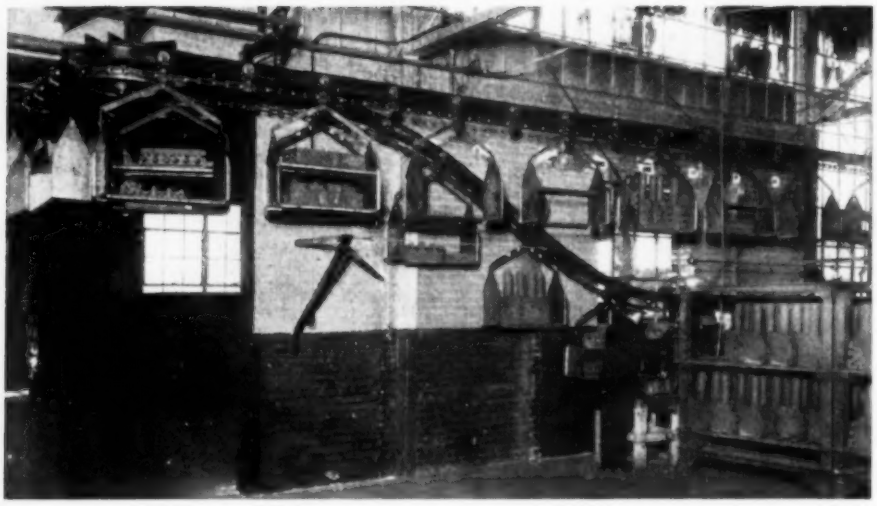


Fig. 1—All cores for a complete engine block are carried on each pair of trays

Carries Cores on Trolley Conveyor

American Foundry Co. uses overhead system to transport cores to the molders stations

By THORPE E. WRIGHT
Link-Belt Co., Indianapolis

SEVERAL years ago the American Foundry Co., Indianapolis, experienced a fire which completely demolished its plant and ruined practically all of the manufacturing equipment. Following the fire, the company obtained the old plant of the Hassler company in Indianapolis, which, with the addition of two buildings, constituted an ideal foundry arrangement. Some time ago a special trolley conveyor was installed to handle cores from the core room to the molders. The Link-Belt Co., Indianapolis, co-operated with the executives of the American company in the design of the conveyor.

Made in Separate Building

Cores are made in an adjacent building which is connected to the main foundry building by a roofed passageway. Coremakers are stationed along the end wall of the building and along a part of the sidewall. The trolley conveyor is so located that it not only receives the finished work of these coremakers but also passes in front of storage racks which contain the smaller cores, making it possible to place upon two consecutive trays all of the cores required to make up one engine block, including the large cores for forming the cylinders and the inner portion of the crankcase.

These large cores are placed on end, side by side. The trolley con- (*Please turn to page* 65)

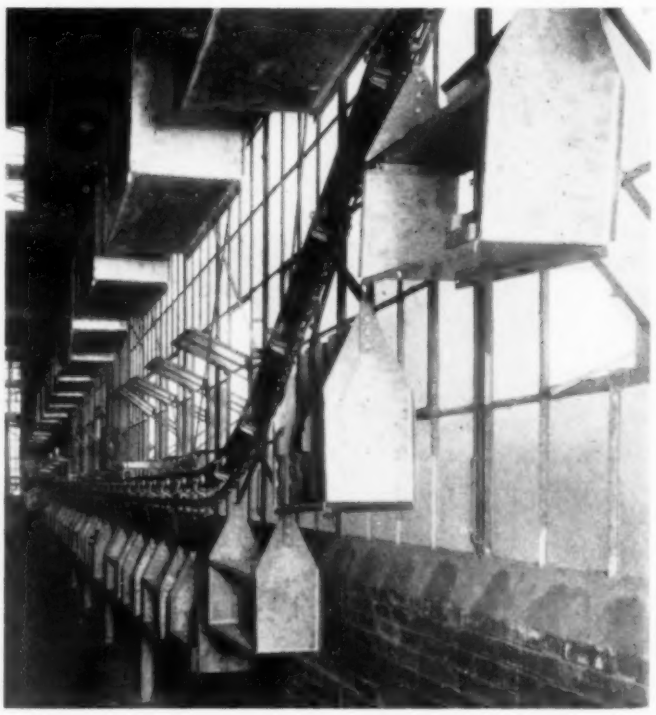


Fig. 2—The conveyor travels along the wall of the building and does not interfere with foundry operations

Stainless Steel Pressure Castings

Methods of molding, coremaking and gating require special care in making valve body

By S. R. ROBINSON

SINCE the introduction of stainless steel, its use in castings has assumed considerable prominence. Therefore it behooves steel foundrymen to become familiar with the peculiarities of that material so that they will be able to produce satisfactory castings when called upon. Owing to the nature of stainless steel, it has been found that production of satisfactory pressure tight castings in that metal offers far more difficulties than occurs in the manufacture of similar castings in other metals.

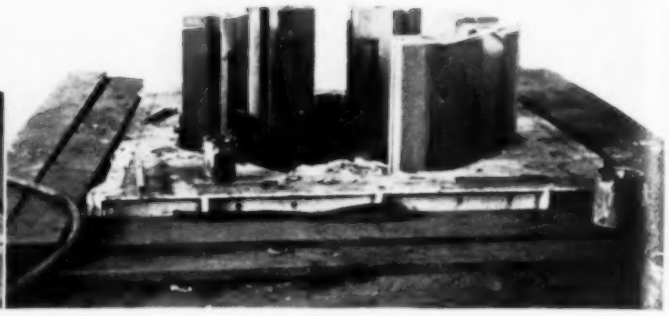
The principal stainless steel alloy contains 18 per cent chromium, 8 per cent nickel, with the carbon content usually under 0.16 per cent, although at times the carbon is specified at 0.07 per cent maximum. That composition has remarkable properties for resisting heat and corrosion. Where it is necessary for the casting to be resistant to corrosion to a greater degree, the chromium content is increased to 24 per cent, the nickel to 12 per cent and the carbon is held under 0.16 per cent. That alloy has excessive shrinkage characteristics and unusual care must be used in preparing the mold and core so that both will collapse and offer only slight resistance to shrinkage of the metal. Best results have been obtained with dry sand molds although some valve bodies have been made satisfactorily in green sand. It has been found that in dry sand the best practice is to have both the molds and the cores not only thoroughly baked but also warm when poured.

Shrinkage Causes Small Crack

Frequently a leak will develop in the fillet at the junction of the flange and body in a valve casting or a fitting such as an ell or tee. That defect usually is due to shrinkage not being relieved, thus causing a minute crack. A satisfactory remedy has been found in the use of shrink boards. A board is rammed up in the mold back of the flange with the end of the board just as close to the body of the pattern as possible. Just as soon as the mold is poured the board is removed, thus permitting free shrinkage of the metal. Preparation for this operation must be undertaken in advance. It will be necessary to have bars and hammers on hand and also to have plenty of help to loosen and lift out the boards immediately after the mold is poured.

To obtain the greatest resistance to corrosion in the stainless composition consisting of 24 per cent chromium, 12 per cent nickel, and carbon 0.16 per cent maximum, the metal should be given a heat treatment consisting of a water quench from 2100 degrees Fahr. Quite frequently a casting will withstand the pressure test before it is heat treated, but will leak after the heat treatment. It has been found that this difficulty is not due to cracking of the metal in heat treatment. More than likely it is due to a crack in the original metal, or to slag or other nonmetallic inclusions in the metal which have been disturbed (*Please turn to page* 65)

Principal stainless steel alloy contains 18 per cent chromium and 8 per cent nickel



Figs. 1 and 2—Two stages in the construction of a mold for the casting shown below in Fig. 3. Dry sand cores are employed extensively to form the face of the mold

Expedite Construction of Pulleys

Manufacturing methods advanced and hazards almost eliminated through use of machines

PRACTICALLY all foundries which engage to any extent in production of cast iron pulleys are equipped with machines for the purpose. These machines do not fulfill all the usual functions of a molding machine, but they represent a great advance on primitive old time pulley making methods and they eliminate most of the hazards incident to the production of that class of castings. The machined joints on the flasks and the machined face plate on which the molds are rammed insure a perfect joint between cope and drag, free alike from unsightly fins that increase the cleaning cost, and still more unsightly crushes which convert an otherwise good casting into a piece of scrap.

Sand Is Rammed on Flat Surface

Pneumatic rammers are employed to ram the sand which is shoveled into the flask in some instances, while in others it is dropped from a grab bucket. In some installations the sand is fed into the pulley flasks from overhead bins equipped with measuring gates. These features depend to a considerable extent on local conditions and the volume of orders. The principle function of the machine is to provide a perfectly flat surface on which to ram the half molds, and a stripping plate through which to draw the pattern of the rim. The arm and hub patterns present no difficulty. The arm patterns remain on the plate when the half mold is removed and the loose hub comes away with the sand and is removed from the mold afterward.

On a large machine capable of handling pulleys ranging between 66 and 72 inches in diameter, a set of six ring patterns 12 inches deep and advancing through 1-inch gradations in diameter, forms part of the equipment. On smaller machines the number of rings and their depth vary to some extent. These ring patterns are slightly tapered and machined with great precision on all surfaces to facilitate their removal from the sand in the mold. The ring pattern is attached or detached readily to or from a cradle under the table of the machines through which it may be moved up or down through a suitable circular slot.

Fig. 3—The casting as it appeared on the sandblast car

On the large machine the cradle with pattern attached is moved through suitable gearing actuated by a hand wheel. In the smaller machines as shown in Fig. 4, this function is performed by compressed air. The piping and valves may be noted immediately back of the machine. By adjusting the height of the pattern ring above the face plate, any desired face width can be secured on the resulting casting. The face of the pulley will equal twice the face of the pattern ring, in the usual event that cope and drag of the mold are exact duplicates and are rammed in succession on the plate without changing the position of the ring pattern. Occasionally it is necessary to produce a pulley in which the arms are off center. In a case of that kind the ring pattern is held at different heights while ramming the cope and the drag. The face on the casting will equal the combined height of the pattern ring in its two positions on the plate.

Fig. 4—The ring pattern is stripped through the circular pattern plate

Loose hubs and sets of arms are available in almost endless variety. Hexagonal radial lines on the machine face serve as guides for the pins which locate the arm patterns. Short, sectional part of the arm patterns are used to extend the regular arms when necessary. With a combination of this kind practically any size, shape or style of pulley can be produced. In the same manner the flasks are arranged so that pulleys ranging through 3 inches variation in diameter may be made in the same flask.

Copes and drags are alike. They are machined on the joints and accurately drilled through a jig to accommodate two guide pins at diametrically opposite points. The pins are not attached permanently, but are employed as occasion demands, first in locating the flask on the pattern plate and later in locating the cope on the drag.

After the proper ring, hub and arm patterns have been adjusted on the plate, the drag half of the flask is located by the pins. Facing sand is distributed over the arms and hub and gaggers are set in place to support the sand later when the mold is removed from the pattern and before the drag is rolled over. A number of narrow, flat, steel bars are hung over the flask bars as shown in Fig. 6 to reinforce the body of sand. The comparatively shallow spider which serves for a set of bars in the pulley flask is bolted to the flask ring and is designed to clear the highest pulley pattern. Hence the use of the flat steel vertical bars which serve as extensions of the regular flask bars.

The pattern ring is stripped from the mold and through the plate and then the drag is lifted, rolled over and placed upon a sand bed on the floor. With bars in the drag, no bottom plate is required. The pattern plate is cleaned off with a brush and a few blasts of air from a convenient air hose. The ring pattern is pushed up through the plate to the proper height and the cope half of the flask is set on and rammed.

Practically the only difference between the cope and drag is the presence of two gate pins on top of the hub in the cope. One of the resulting gates is larger than the other and is used as a feeder after the casting is poured. Hubs on most large pulleys must be fed through the riser while the metal is solidifying.

The cope half of the mold is not turned over after it is lifted off the machine. The flask is held suspended by the crane while the molder removes the hub pattern, reams out the gates and brushes plumbago on the face of the hub arms. The center core, and in some instances the splitting cores, are placed in the mold. Then the cope is placed on the drag and clamped. A runner basin is made up extending from the edge of the cope to (*Please turn to page* 49)

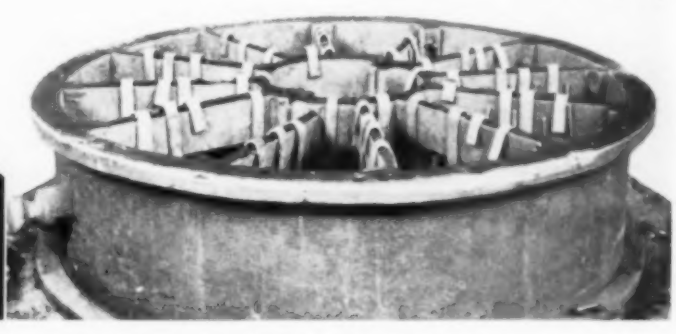


Fig. 5 (Left)—A pulley flask contains no excess sand outside the pattern. Fig. 6—(Right)—Bent flat steel rods supplement the bars and support the hanging body of sand

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the following advisory staff: Steel, John Howe Hall; Malleable, H. A. Schwartz; Gray Iron, John W. Bolton; Nonferrous, Charles Vickers.

Alloy Steel Not Needed In Molds for Gold Bullion

Can you give any information on the proper alloy steel to be used in making molds for pouring gold, and the best method of molding?

As far as we know, no special steel or alloy is required for making molds for pouring gold. All that is necessary for such an ingot mold, is that the metal should be sound and free from pinholes. Some makers of gold leaf pour their ingots into cast iron molds which they machine in their own shops.

Heat Treat Pattern Plates To Eliminate Warp

We are making gray iron plates for mounting our patterns. The charge consists of 50 per cent pig iron and 50 per cent sprues and scrap, and the resulting iron contains 2.24 per cent silicon; 0.072 per cent sulphur; 0.563 per cent phosphorus; 0.59 per cent manganese, and 3.25 per cent total carbon. The pattern plates are machined on the face and the pads beneath. When machining has been completed, the plates are level to within 0.002-inch. Some hours later we have rechecked these plates and some of them are found to have warped as much as 0.012-inch. Is that warpage due to internal strains or other causes?

Warpage of your pattern plates after machining is caused by internal strains resulting from gating or pouring practice. Sometimes the trouble can be overcome by changing the method of gating but usually the castings are subjected to a slow aging process under atmospheric conditions or through a more rapid process of heating to known temperatures for varying lengths of time. Slow aging seldom is used because it may occupy as long as 6 months before the desired results are obtained. However, many castings are heat-treated or annealed at comparatively low temperatures to relieve internal strains. It is suggested that you heat your castings to 900 degrees Fahr. for a couple of hours, and allow the castings to cool in the furnace. Slow cooling is essential.

Desires High Brinell In Hydraulic Pump Liners

We have an inquiry for some hydraulic pump castings composing the pump case, and the front and back liners. The thicknesses vary from 1⅛ to 3 inches and must be machined. An iron is desired which will give an actual brinell of 250 to 300 in the castings themselves. Can you suggest a suitable mixture for the castings?

It is said that the best method to obtain a brinell of 250 to 300 in complicated castings is to use enough nickel to obtain a semimartensitic structure as cast. Not knowing what analysis you usually employ, it is suggested that you try about 5 per cent nickel in your regular metal. That may run a little harder than you desire, but the hardness will be uniform. Somewhat similar results may be obtained by using chrominm or molybdenum with nickel. Probably 0.50 to 0.75 per cent chromium with 1 to 1.5 per cent nickel might run over 250 brinell hardness.

Another way to get higher hardness on simple shapes such as the liners is to oil quench the regular nonalloy iron from 1550 to 1600 degrees Fahr. In medium sections that will give 450 to 525 brinell hardness. The castings then are drawn to obtain the desired hardness. That will require some experimenting as the initial hardness will depend on the section thickness. A 3-inch section will quench slower than a light section. If a trial casting were quenched as suggested, a trial draw at 750 degrees Fahr. for 2 or 3 hours is suggested. If the hardness is

still high give a further draw of 2 to 3 hours at 450 degrees Fahr.

Heat treatment should not be attempted with large or nonuniform castings due to the danger of cracking. Where it can be employed, it is less costly than high alloy additions. Any of the methods suggested should produce metal free from chill spots even though the brinell is high. Such material, of course, is rather difficult to machine. If heat treatment can be employed, rough machining can be performed before quenching.

Chromium Plate Does Not Adhere Around Pinholes

We are chrome plating yellow brass castings and are having many difficulties, due to the chrome plate not adhering to the casting in and around the small pin holes which, no doubt, is dross. The castings are polished highly before being plated and we are unable to detect any defects except after the chrome plate has been applied. The face of the castings are all in the drag, with gates and leaders in the cope. Also our work is not cored. We have changed our method of gating several times but get no better results to speak of. We use skim cores and pour the mold in a horizontal position. We are using new metal 65 copper, 35 zinc, and 2 lead. Would we get better results using a composition of 85-5-5-5 for chrome plated work or could you recommend a formula more suitable?

It is altogether probable that the small pinholes referred to are dross due to the fact that the metal is being cast without the addition of aluminum. It is suggested that if you prefer that alloy to add 2 ounces of aluminum to each 100 pounds of metal. However, we believe that for castings that are to be chromium plated that you will obtain better results through using ounce metal, the 85-5-5-5 alloy you mention. That metal may cost a little more originally, but considerable saving should be possible through reduction of scrap castings. The 85-5-5-5 alloy is quite suitable for the work you have in mind.

Pipe Ball Manganese Steel Will Contain Chromium

Can you give me a mix for manganese steel pipe balls, advising whether an open or close silica sand should be used, and such other information as you can give me in the matter?

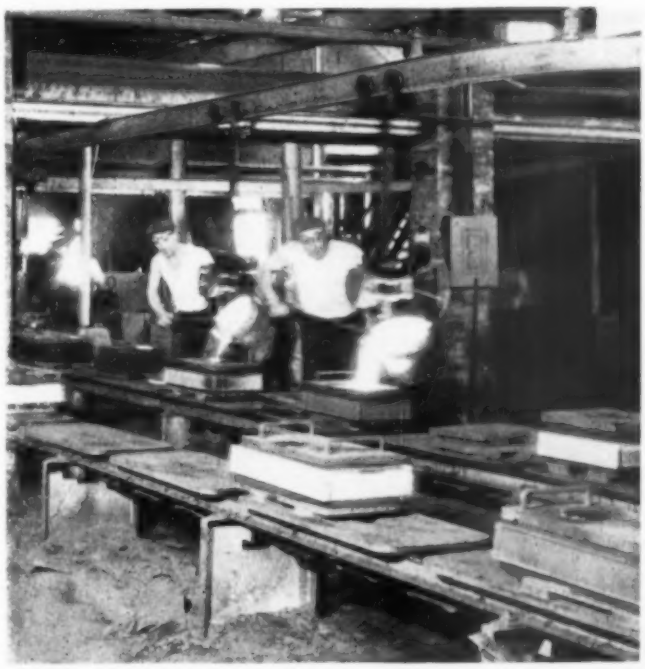
Production of manganese steel castings is a highly specialized field, and unless you are familiar with its idiosyncrasies, it is advisable to stick to your regular line of work. Pipe balls usually are made with the following composition: Carbon, 1.20 to 1.45 per cent; silicon, 0.20 to 0.90 per cent; sulphur and phosphorus, 0.06 per cent maximum; manganese, 12.50 to 15.00 per cent and chromium, 1.25 per cent. It is claimed that the best results are obtained when the carbon and manganese are at the maximum point. With the higher carbon and manganese content, considerably higher temperatures and longer soaking time are necessary to insure complete solution of the carbides.

Heat treatment at 1900 degrees Fahr. for a sufficient time to insure that all parts of the castings have attained that temperature, and a rapid quench in cold running water is recommended for the desired physical properties. Sand used for molding, as for all steel molding, should be as permeable as possible so that the gases generated during pouring are evacuated rapidly. Sand at the mold face may be a little finer to obtain a smoother skin on the casting. Water content should be as low as possible and still have the sand workable.

Wrong Alloy Causes Shrinks in Hinge Castings

I am forwarding two toilet hinge castings for examination. The mixture is supposed to be copper 75, tin 2, lead 5, zinc 18. The molds are end poured with the flask at an angle of 15 or 20 degrees with the vertical. Please note shrink in knob on the end and give us your opinion as to the cause and what we might try to eliminate this trouble. We also have quite a bit of trouble with spots as shown on polished sample enclosed. We are using a large percentage of chips sometimes all chips. We use No. 45 pot and put 1 to 2 ounces manganese copper in pot before skimming and pouring. We pour at around 2100 degrees.

Your trouble arises from the fact that you are using the wrong alloy for such hardware. Two alloys are suggested from which a selection can be made. The first one is harder than the second, both machine and polish well, and either is stronger than the alloy you now are using. The first contains 55 pounds copper; 42.25 pounds zinc; 2.50 pounds lead, and 0.25 pound



aluminum. The second is composed of 60 pounds copper; 37.25 pounds zinc; 2.5 pounds lead, and 0.25 pound aluminum.

Make the molds flat and raise one end by resting the flasks on a piece of 2 x 4-inch scantling, so that the gate will be at the lowest end of the mold. In that way the metal will flow uphill, filling the runner first and then rise into the castings.

Molds for Aluminum Ingots Do Not Stand Up

We are making cast iron ingot molds for molten aluminum, but they do not stand up satisfactorily in service. We have molded them face up and face down, but the result apparently is the same. Pits develop in the face of the mold and leave objectionable marks on the face of the ingot. Iron for these castings is melted in an electric furnace. The mixture contains 79 per cent No. 2 foundry pig iron, 20 per cent machinery scrap and 1 per cent ferrosilicon (20 per cent silicon content). The molds are made in a fairly coarse grade molding sand. We also have tried various gating arrangements.

Two or three minor features in your present practice will stand revision in the interest of economy, but the immediate source of your present trouble is steam from the mound of sand which forms the inside of the mold. The steam does not escape easily or rapidly enough. A certain amount flutters over the surface and enters the molten iron. This produces a honeycombed or porous structure under a skin which is exposed when the mold is filled later with molten aluminum. The remedy is to work the sand in the mound as dry as possible, ram it gently, vent it thoroughly with a ¼-inch vent wire and then provide a channel between the sand and the bottom board for the gas and steam to escape readily.

The present method of gating is satisfactory, but a 1½-inch sprue will serve just as well as the present 2-inch sprue. The risers are not necessary and may be eliminated. We are at a loss to understand why you use such an excessive amount of pig iron in the mixture, particularly when the metal is melted in an electric furnace. The ideal iron for these castings, subject to cracking through alternate heating and cooling, is a bessemer or malleable iron, low in phosphorus and sulphur. If you have not already experimented and if no malleable pig is available, we suggest a mixture of 30 per cent No. 2 foundry pig iron, 50 per cent machinery scrap and 20 per cent steel scrap. The steel will reduce the phosphorus content and a desulphurizing agent can be added to reduce the sulphur. A suitable analysis for these castings is: Silicon 2.00 to 2.25 per cent, phosphorus 0.20 per cent, manganese 0.80 per cent, sulphur 0.05 per cent.

Gray Iron Resists Alkali Satisfactorily

We are contemplating manufacture of some small alkali and acid resisting castings weighing approximately 5 pounds each with sections varying from ¼ to 1-inch. What would be the best chemical analyses for that class of work, and the best melting stock to use? We have several grades of pig iron and scrap on hand including clean steel scrap. The iron will be melted in a 24-inch cupola. Castings will be subjected to strong caustic solution and also dilute sulphuric acid.

Gray iron resists action of strong caustic, hot or cold, in a satisfactory manner. Best service is given by a dense, close-grained iron. Probably a 10 to 20 per cent steel mixture, melted hot (over 2700 degrees Fahr.) with a silicon content about 2.25 per cent and total carbon under 3.25 per cent will be machinable in a ¼-inch section and give sufficiently dense grain in the 1-inch section for chemical castings.

Nickel improves resistance to caustic, and a desirable mixture would contain 1.0 per cent nickel, 1.75 per cent silicon, and under 3.25 per cent total carbon. As a rule high phosphorus should be avoided. Sulphur should be under 0.12 per cent and manganese from 0.50 to 0.80 per cent. Addition of chromium is not beneficial. You will have to be guided by your ¼-inch section, and adjust the composition so that it will not be chilled. There are factors aside from analysis which have an effect on the chilling tendency so it may be necessary to modify the compositions mentioned slightly.

Although gray iron is fairly resistant to concentrated sulphuric acid (95 per cent or 66 degrees Beaume), it is attacked rapidly by dilute acid (under 78 per cent or 60 degrees Beaume). As a general rule good tin or tin-lead bronze castings are fairly satisfactory for handling dilute sulphuric acid. Lead is excellent from a corrosion viewpoint, but weak and soft mechanically. Monel metal and high nickel bronzes are good. Aluminum bronze is fair. The only cast iron compositions which are satisfactory for handling dilute sulphuric acid are the austenitic irons. One of those contains 12 to 15 per cent nickel, 4 to 7 per cent copper, and 1 to 2 per cent chromium. It is claimed that the alloy iron can be melted successfully in the cupola.

Sulphur Variation Shows Lack of Control

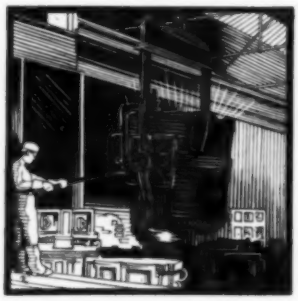
We are producing malleable cast iron by the duplex process. While desulphurization is practiced and the sulphur range usually is between 0.02 to 0.10 per cent, castings containing from 0.15 to 0.2 per cent occasionally are delivered to the annealing department. What would be the procedure in such a case in America? Does the annealing superintendent accept or reject castings containing traces of free carbon? Occasionally we get some castings that have a white rim with a dark center. What is the cause?

Apparently, there is a lack of supervision when a desulphurization process is employed, and the sulphur content rises as high as 0.15 to 0.20 per cent. Ordinary cupola malleable without desulphurization will not be above that range. Therefore, it is suggested that closer check be maintained on the raw materials entering the cupola and upon the desulphurization process. We do not quite understand your reference to what procedure or practice would be used with high sulphur iron. If you mean annealing procedure, we do not believe that you will have any trouble if you are annealing at say around 1750 degrees Fahr. unless the manganese content is insufficient to counteract the sulphur. Then trouble will occur due to picture framing of the castings which usually shows up as a white decarburized rim an inner rim of coarsely laminated pearlite, and the interior core corresponds to the structure of normal malleable cast iron.

If your inquiry on procedure or practice means whether the high sulphur castings should be accepted or rejected, all that can be said is that it depends upon what the castings are or what they will be used for. If they are castings that do not have to have the highest strength and physical properties, the high sulphur may not make much difference. If the reverse is the case, it probably will be necessary to reject the castings.

We should say that castings containing traces of free graphite should be rejected as there is no reason why that condition should occur. Sufficient test pieces should be taken during the running of the heat in the cupola to prevent producing iron which contains any free graphite. Test sprues poured every 6 minutes and fractured will indicate any change in composition. The latter is supplemented by samples forwarded to the laboratory for rapid analysis at frequent intervals. However, as in the case of the high sulphur iron, the decision will rest upon what is expected of the castings. Free graphite reduces the physical properties of the iron as might be expected.

Viewing Foundry Developments



At Short Range

A GERMAN development, known as migra or micro/graphitic pig iron is attracting attention in Europe. This product, which sells at $2 to $3 a ton over the standard foundry grades involves a supplementary heating process by which the molten iron from the blast furnace is placed in a fuel fired rotary furnace and the temperature is increased. The manufacturers recommend the use of from 20 to 25 per cent of the migra iron in the cupola mix and claim a 15 per cent increase in physical properties. The migra iron is made in both high and low carbon and high and low silicon ranges. The superiority claimed is based upon finely divided graphite structure.

♦ ♦ ♦

A core blowing machine recently developed has produced large cores having a volume of 1 cubic foot and requiring in the neighborhood of 100 pounds of sand. The same machine has been employed experimentally in the blowing of molds, with considerable success.

♦ ♦ ♦

THE small cupola, economical medium for melting under reduced operation, has been an interesting factor in recent foundry operations. An eastern foundryman improvised a stack from 38-inch gray iron ring castings, lined down to 28 inches. A novel thought was placing the wind belt inside which gives a small preheating effect that results in higher temperature metal when tapped.

♦ ♦ ♦

Segregation of carbon (kish) frequently occur if the sum of the total carbon plus the silicon is around 5.9 per cent in the first pig iron charges, and the method of heating the cupola is such that, after filling to the charging door, the charges are allowed to stay in contact with the burning coke for a longer period of time than usual before the blast is put on. The height of the bed coke as well as its chemical and physical characteristics play an important part in this procedure.

♦ ♦ ♦

Square cooking utensils seem to be a probability following a successful experiment with square dish pans and square wash tubs. It is claimed that the new shape proves particularly efficient for a wide variety of purposes.

♦ ♦ ♦

Copper is considered a good material for brass strip ingot molds, either as a solid mold of slightly greater thickness than one of cast iron or as a thinner, water cooled mold.

♦ ♦ ♦

ALMOST important opportunity for increasing efficiency and reducing fuel cost in old open-hearth furnaces is found in proper insulation of walls above the ground in both slag pockets and regenerators. Most of the trouble is caused by air infiltration, but this can be eliminated by a relatively simple addition of insulation and steel plate outside construction which can be installed by tearing out only the outside brick walls and salvaging the present brick walls, buck stays, arches and other parts.

♦ ♦ ♦

Application of the wear resisting qualities of austenitic high manganese cast steel in combination with structural steel trackwork has been evolved by an eastern manufacturer. The rails are welded and reinforced with special plates and a solid manganese steel casting is superimposed and welded in place to make a solid unit frog or crossover structure.

♦ ♦ ♦

A western manufacturer of coke has found that nickel-chromium cast iron ram shoes have a life several times as long as steel shoes formerly used. These shoes are made from a 65 per cent steel mixture of the following analysis: Total carbon 3.00, silicon 1.00, manganese 0.90, nickel 1.25 and chromium 0.25 per cent.

♦ ♦ ♦

A combination of hydraulic and air pressure is used in a German built molding machine for piston rings and similar types of castings. No fill-up frame is required for this squeeze type equipment.

♦ ♦ ♦

A CAST iron camshaft now being used by one of the large automobile manufacturers has the following composition: Silicon, 2.2 to 2.35 per cent; sulphur, 0.10 maximum; phosphorus, 0.20 maximum; manganese, 0.50 to 0.56 per cent; combined carbon, 0.55-1.00 per cent; total carbon, 3.15 per cent; nickel, 0.40 to 0.50 per cent; chromium, 0.80 to 1.00 per cent; molybdenum, 0.40 to 0.50 per cent. The iron has a tensile strength of 50,000 pounds per square inch.

♦ ♦ ♦

Equipment supported from monorail trolleys such as ladles, may be moved over the system by a new mo-

tor which is driven through a caterpillar tread operating on the bottom of a monorail track. The caterpillar has rubber treads.

♦ ♦ ♦

Experiments conducted by A. H. Dierker, Ohio State University, show that the sulphur pickup from the fuel when dolomite is used as a flux in the cupola is just half the amount absorbed when straight limestone is used.

The FOUNDRY Family Photograph Album

Upper Left
H. V. FELL
Sheffield, England

Upper Right
P. J. STRANGWARD
Forrest City Foundries Co.,
Cleveland

Lower Left
W. J. KOHLER
Kohler Co.,
Kohler, Wis.

Lower Right
FRANK A. TRUEL
York Ice Machinery Corp.,
York, Pa.

Men of Industry

Whose Activities Are Making Foundry History

THOMAS W. PANGBORN, president, Pangborn Corp., Hagerstown, Md., was elected vice president of the National Founders' association at its recent convention in New York. Mr. Pangborn brings to his new post a wide background of experience in general business matters as well as first-hand knowledge of the foundry and equipment industries. He was born in Brooklyn, N. Y., in 1880, spent his early childhood in Minnesota, and returned to New York at the age of 17 when he received his first experience in foundry activity. In 1900 he became a salesman for Hendricks Bros., New York, dealers in metals, and continued with them until 1904 when he founded the Pangborn Corp.

When two of the seven banks in Hagerstown closed last year, Mr. Pangborn was drafted to take charge of the principal bank and a short time later was elected president of the Clearing House association to co-ordinate the activities of the five remaining banks.

Mr. Pangborn is past president and now director of the Foundry Equipment Manufacturer's association, a past director of the American Foundrymen's association, a member of the American Society of Mechanical Engineers, a director of the Equitable Trust Co., and the Maryland-Virginia Joint Stock Land Bank, both of Baltimore; state director of the Liberty Mutual Insurance Co., Boston; president of the Washington County Manufacturer's association, Hagerstown and during the war was county director of the Maryland State Fuel administration.

HARVEY H. WEBER has been appointed superintendent of the Burnside Steel Foundry Co., Chicago.

WILLIAM C. BAIRD, Buffalo Pipe & Foundry Corp. and EDGAR A. FORSYTH Jr., Buffalo Forge Co., both of Buffalo, have been elected directors of the new junior chamber of commerce of Buffalo.

JOHN H. ROMANN, at one time connected with the American Steel Foundries and for the past 7 years general superintendent of the Ewald Iron Co., Louisville, Ky., has been appointed general manager of the latter company.

DR. IRVING LANGMUIR, associate director, General Electric Research laboratory, Schenectady, N. Y. was presented the Nobel award in chemistry for 1932 in Stockholm on Dec. 10. Dr. Langmuir is the second American chemist to have been so honored by the Swedish Academy of Science in 31 years.

HUGH BENET, formerly manager, Holyoke, Mass. works of the Worthington Pump & Machinery Corp., has been appointed manager of the corporation works at Harrison, N. J. WALTER F. PERKINS, formerly manager of the Harrison works has resigned to become vice president and general manager, Bartlett Hayward Co., Baltimore.

JAMES HUGHES, West De Pere, Wis., since 1906 associated with Frederic B. Stevens Inc., Detroit, as salesman in Michigan, Wisconsin, Illinois and Iowa, was elected to congress on Nov. 8. Mr. Hughes was born Aug. 7, 1883 at Green Bay, Wis., a son of James Vincent Hughes a pioneer foundryman of Wisconsin, who died July 25, 1932.

FRANK A. TRUEL now is superintendent of the York Foundry & Machine Co., York, Pa. Mr. Truel learned his trade as a molder and then was graduated by McLain System Inc., Milwaukee. Later he was foundry superintendent, Municipal Foundries Inc., West Allis, Wis.; superintendent of the Neenah Foundry Co., Neenah, Wis., and superintendent, Lakeside Foundries Corp., Milwaukee.

ERIC WISBURN, formerly in charge of the chemical and physical laboratory of the Liberty Foundries Co., Rockford, Ill., and previous to that research engineer, the Perfect Circle Co., Hagerstown, Ind., has established a foundry consulting service with headquarters at 1740 East 12th street, Cleveland. Mr. Wisburn received his technical education in Germany and before coming to this country worked in a number of foundries making a variety of work. He recently returned from a 6 months trip during which he visited foundries in Germany, Switzerland and France.

DANIEL P. GITZEN recently was made foundry superintendent of the D. C. R. Foundry Co., Kalamazoo, Mich. Mr. Gitzen was born in Port Washington, Wis., in 1877 and served his apprenticeship in foundry practice at the Gilson Mfg. Co., Port Washington. Since then he has served as foreman of the Milwaukee Steel Foundry Co., Milwaukee; general foreman of the Koehring Co., Milwaukee; superintendent of the Iowa Valve Co., Oskaloosa, Ia.; superintendent of the Jenkins Machine Co., Sheboygan Falls, Wis.; foreman of the Nash Motors Co., Kenosha, Wis.; and superintendent of Fuller & Sons, Kalamazoo, Mich. Mr. Gitzen is graduate of McLain's System Inc., Milwaukee.

WESLEY G. NICHOLS has retired as president of the American Manganese Steel Co., Chicago Heights, Ill. Mr. Nichols has had a long and varied career, not only in the production of manganese steel castings but also in other branches of the steel business. In 1896, only a few years after manganese steel first was made in America, he was employed by the Taylor Iron & Steel Co., High Bridge, N. J. When, in 1905, the American Brake Shoe & Foundry Co. undertook the manufacture of manganese steel at Chicago Heights, Mr. Nichols organized the operating phase of that business, and continued in direct charge of operations for 15 years. Shortly after the Edgar Allen American Manganese Steel Co. was organized in 1910 to handle the manganese steel business, he was elected vice president. In 1915, this company became the American Manganese Steel Co., a subsidiary of the American Brake Shoe & Foundry Co. and in 1920 Mr. Nichols was elected president.

W. E. CROCOMBE, president of the American Forge Co., has been elected president of the American Manganese Steel Co.

Reader's Comment

Interesting communications from readers of The Foundry

EDITOR'S NOTE—*Material Appearing Under this Head Does Not Necessarily Reflect the Opinion of* THE FOUNDRY *or Of Its Editors.*

Most Interesting

TO MR. PENTON:

I have read with a great deal of interest the Fortieth Year Anniversary announcement of THE FOUNDRY magazine. Reproduction of the first issue of THE FOUNDRY was most interesting.

I wish you continued happiness and success in the very great measure which you deserve.

FRANK D. CHASE

Frank D. Chase, Inc.
Chicago

Outstanding Merit

TO THE EDITORS:

In line with many of your readers, I would beg to be allowed the opportunity of extending to you my heartiest congratulations on the truly excellent quality of your publication, whose contents are most informative both to the technologist and to the man in the works. A publication of such outstanding merit is one for which none of us can be too grateful.

J. KENTSMITH

Climax Molybdenum Corp.
Detroit

Fond Recollections

TO THE EDITORS:

On my return to the office from an extended absence, your letter of Sept. 21 was handed me together with the article regarding John A. and his first publication of "The Foundry."

I read it with great interest, and I appreciate your having sent it to me very much. I have many fond recollections of our association, antedating even the year of 1892.

W. H. MC FADDEN

Southland Royalty Co.
Ponca City, Okla.

New Conditions

TO THE EDITORS:

Congratulations to the malleable castings industry's best friend, Robert E. Belt, for displaying so graphically the increased fixed costs which malleable castings must carry now as compared to 1914 and later. May some of the modern school of malleable price inventors read this November issue and take heed of these new conditions. If Mr. Belt had shown comparisons of average selling prices existing for those same periods, he would have proven conclusively that he belonged to a brotherhood of broad benevolence.

T. F. HAMMER

Malleable Iron Fittings Co.
Branford, Conn.

Puts Into Practice

TO THE EDITORS:

No foundryman can afford to be without THE FOUNDRY, and I know it has been a great help to me as a foreman. For a number of years the firm with which I was connected made water fronts with great success. The latter part of last year we ran into a snag and the losses were from 40 to 50 per cent.

About that time I saw an article in THE FOUNDRY on the cause of losses in water fronts. I read the article very carefully and then studied the cause of the difficulty in our plant. I then put one of the articles which I read in THE FOUNDRY, into practice and reduced our loss to 3 per cent. This is just one of the many articles that I have put into practice.

JOHN G. FRIEND

Scranton, Pa.

Engineer's Week Planned for World's Fair

What promises to be one of the greatest and most important conferences of engineers ever held, will convene in Chicago during the week of June 25-30 in connection with A Century of Progress Exposition. World's Fair officials have designated this period as *Engineering Week*, and one day will be known as *Engineers' Day*. This will be held the week following the convention and exhibition of the American Foundrymen's association and during the annual meeting of the American Society for Testing Materials.

Early estimates of the probable attendance of engineers from all parts of the country, as well as from many European countries, place the figure at a minimum of 25,000 with a possibility of triple that number. A general committee known as the Engineering Societies committee of A Century of Progress Exposition has already been established in Chicago under the chairmanship of Harry B. Gear. Organization work is now under way and a number of sub-committees have been appointed to function on the various phases of the coming event.

The plan is for the various societies to hold individual or joint meetings of their own groups except for "Engineers' Day" when all groups will join in a giant conference. The outstanding engineers of this and other countries wil appear on the program.

Approval of participation has already been given by 19 engineering associations, including the American Foundrymen's association, American Society for Testing Materials, American Ceramic society, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, and Western Society of Engineers.

Book Review

Economics: Principles and Problems, by Lionel D. Edie, cloth, 859 pages, 6 x 9 inches, published by Thomas Y. Crowell Co. and supplied by THE FOUNDRY, Cleveland, for $5.00 plus 15 cents postage, and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westmintser, London.

Many important changes in the field of economics during the past few years have necessitated such extensive revisions in this standard text that the second edition has become essentially a new work. The author has aimed not merely at bringing up to date the statistical data but also in amending and clarifying the theory.

The study is developed according to the classic divisions of the subject, namely, production, consumption, exchange and distribution. Into this outline is woven an original presentation of the new points of emphasis, such as quantitative and statistical analyses, institutional and dynamic factors, the significance of production technology, the growth of the science of consumption, business economics, the money economy, pecuniary activity, reliance upon concrete description of economic life, recognition of modern psychology and a concern for social control of economic processes. These are divdied into eight parts under the following headings: Introduction; production and consumption; value of exchange; distribution and related problems; money, credit and banking; international economic relations; government and taxation; and economic control.

A better understanding of much of the subject matter is provided through the inclusion of 59 charts covering a wide variety of statistical information. While the work is prepared primarily as a text book for the university student, the treatment is such that the book should find a wide public.

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Resistance of Iron to Corrosion

Study influence of amount of silicon present and size, shape and distribution of graphite

By H. NIPPER
and
E. PIWOWARSKY

SYSTEMATIC research on gray iron melts, carried out especially during the last 20 years, has increased considerably knowledge of that material. Relations have been determined between chemical composition, conditions of melting, pouring, solidification and cooling, and ensuing heat treatments in the solid state on the one hand, and structure and mechanical properties on the other. However, in other fields, such as corrosion, opinions still are divergent concerning influences of chemical composition, size, shape and distribution of graphite, and of the matrix structure. The reason for this lies in the fact, that in nearly all previous research work on the subject, experimental data such as structure, degree of uniformity of material, precise conditions of testing, etc., were not stated adequately.

Influence on Corrosion

Work described here was carried out to determine influence of the kind of graphite precipitation and of the silicon content (1.2 to 3.5 per cent) on corrosion of gray iron.

Five melts, each weighing 77 pounds, were made in graphite crucibles in an oil-fired furnace. Mixtures consisted of Swedish charcoal iron, commercially pure iron and ferroalloys. They were melted under exactly the same conditions and poured at a temperature of 1300 degrees Cent. (2372 degrees Fahr.) into test bars of 1 1/3 inches diameter and 15¾ inches long and into place for soil corrosion tests. Samples were cast in either chills, green sand molds, dry sand molds or highly preheated sand molds (400 degrees Cent. or 752 degrees Fahr.). All the samples were rendered ferritic by a short anneal.

Table I shows the chemical composition of the melts.

All contents are practically constant, with the exception of silicon, which was varied from 3.5 to 1.2 per cent. To determine the corrosion resistance, cylindrical samples 1 1/5 inches in diameter and 2/5-inch high were machined from the annealed test bars and placed on glass supports in various corrosive liquids for different periods of time, at a temperature of 20 degrees Cent. (68 degrees Fahr.). Corrosive liquids in some tests were stirred at a constant velocity, while in others they were kept entirely still. From the cast plates samples 2 x 2 x 2/5 inches were machined and placed in loose wet soil.

Total losses in weight of the samples are shown in Table II and III. Rust was completely removed from each sample by treating in a solution of 8 per cent sodium hydroxide and zinc dust, at a temperature of 30 to 80 degrees Cent. (86-176 degrees Fahr.). Intermediate weights are not given in this abstract, as loss in weight was virtually in direct proportion to the time factor.

Figs. 1 and 2 are diagrammatic representations of the corrosive attack on the various structures and show loss in weight in grams per 100 square centimeter of surface per hour or day. Micrographs are included showing typical graphite formations of the most characteristic samples. These are lettered in accordance with the corresponding s.

Table I

Chemical Composition of Melts

Melt No.	Total Carbon Per cent	Graphitic Carbon Per cent	Silicon Per cent	Manganese Per cent	Phosphorus Per cent	Sulphur Per cent
6	2.80	2.80	3.56	0.41	0.059	0.025
1	3.05	3.03	2.70	0.40	0.053	0.024
2	3.04	3.02	2.22	0.40	0.058	0.024
3	3.02	3.00	1.80	0.40	0.058	0.024
4	3.03	3.02	1.28	0.41	0.054	0.024

Table II

Corrosion Tests in Hydrochloric Acid

(One Half Normal)

Loss in Weight in Grams per Hundred Sq. Cm. of Surface. (Average of three tests)—Cast in:

Melt No.	Days	Si. Per cent	A Chill	B Wet Sand	C Dry Sand	D Preheated Mold
6	50	3.56	25.295	.....	.....	9.169
1	50	2.70	17.734	10.304	9.957	9.095
2	50	2.22	5.050	17.156	15.173	10.592
3	50	1.80	4.94	14.442	12.301	11.307
4	50	1.28	4.927	6.52	10.835	9.251

Table III

Corrosion Tests in Wet Soil

Loss in Weight in Grams per Hundred Sq. Cm. of Surface. (Average of three tests)—Cast in:

Melt No.	Days	Si. Per cent	A Chill	B Wet Sand	C Dry Sand	D Preheated Mold
1	70	2.70	1.017	0.929	.830	.818
2	70	2.22	.257	.450	.295	.266
3	70	1.80	0.251	.435	.287	.278
4	70	1.28	.232	0.286	.413	.330

ples as shown in Figs. 1 and 2. Some of the melts were repeated and the findings of the investigation were corroborated. It would be beyond the scope of this work to discuss the mechanism of corrosion, as much valuable work on that question has been published.

The results may be summarized as follows: In dilute acids, especially hydrochloric acid which is strongly corrosive, the predominating factor is the number of local cells present, which means the relation of the graphite contents to the graphite surface.

Thus, eutectic graphite, which exhibits the greatest surface, causes increased corrosion. This eutectic formation is produced in melts rich in silicon by chill casting, and in melts poor in silicon by the slower cooled sand casting, although in the latter case the graphite would not be so fine.

Causes Least Corrosion

Temper carbon with the least surface and the greatest isolation of particles causes less corrosion. Short, thick graphite flakes not interconnected also show good qualities in this respect. A higher silicon content appears to increase corrosion in soil, but as regards the attack by dilute acids and salt solutions, the silicon content between the limits examined did not appear to effect any appreciable influence.

Compared with one-tenth normal hydrochloric acid, corrosion occurred to a smaller extent in one-fifth normal acetic acid, and to a still less degree in one-tenth normal sodium chloride. This diminuition in corrosive attack causes a progressive flattening of the peaks in the respective corrosion diagrams, but the characteristics are similar in all cases. The limit is almost;; reached with corrosion in one-tenth normal ammonium sulphate solution, where the attack proceeds to practically the same extent in all samples of the same composition, regardless of structure. However, the melts with 2.2 and 1.8 per cent silicon contents appear to be corroded more than others. All melts appear to be immune to attack by 20 per cent sodium bicarbonate solution or 25 per cent potassium hydroxide solution.

An extremely high grade polish on the specimens caused a somewhat greater resistance to corrosion.

When the corrosive media was not stirred, the attack proceeded much more slowly.

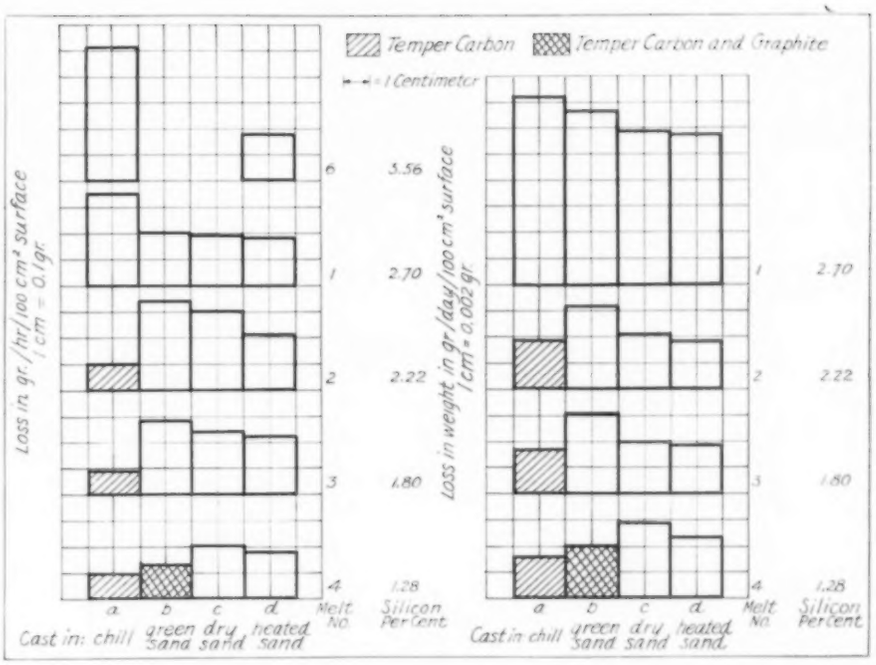

Fig. 1—Corrosion attack in ½ normal hydrochloric acid. Fig. 2—Corrosive attack in wet soil

Book Review

Combustion, 207 pages, 8¾ x 12 inches, paper, published by the American Gas association, and supplied by THE FOUNDRY, Cleveland for $2.00 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., 416-17 Caxton house, Westminster, London.

While this is published as the third edition of the work, originally presented in 1924, developments which have taken place in the industrial gas field, both in practice and in knowledge of fundamental theory, necessitated rewriting the entire book. A substantial portion deals with information on the competitive nature of fuel for industrial heating.

The book divides roughly into two parts, theoretical and practical, both of which have been enlarged considerably. Material presented includes information on heat and its measurements, gas volume and pressure, chemistry of combustion, thermal capacity, heat transfer, combustion data of commercial gases, atmospheric burners, industrial combustion equipment, temperature control, heat salvage methods, gas analysis, and fuel comparisons.

The large amount of engineering data, basic information regarding the materials entering into the process of combustion as well as the materials and equipment being heated, should be of value to all interested in the subject of combustion.

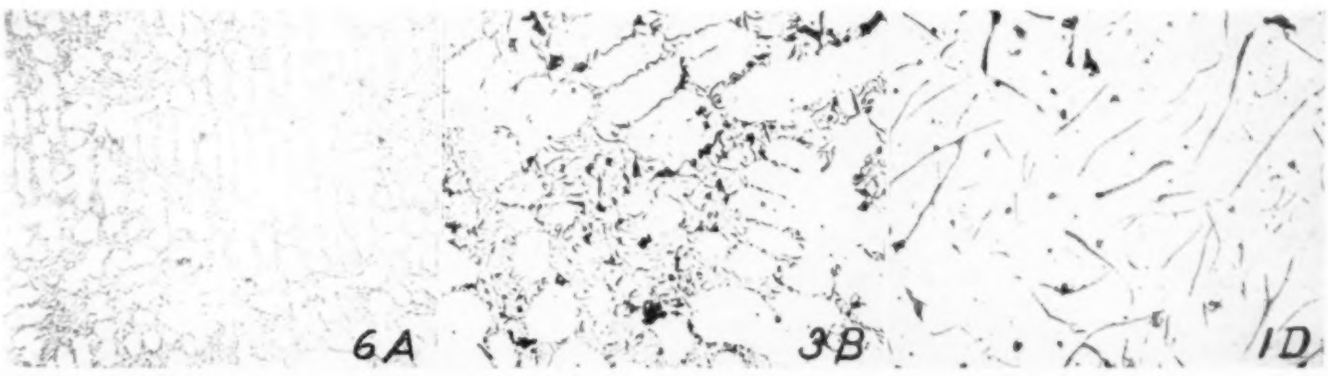

Fig. 3—Micrographs showing typical graphite formations. Letters indicate corresponding samples in Figs. 1 and 2

A Rolling Stone

Does Not Appeal To Him

WHAT with the recent depression and one thing and another, now happily past—says you—it is well within the range of possibility that Edgar E. Durant, proprietor G. F. Warner Mfg. Works, New Haven, Conn., may have wondered at times during the past couple of years if it would not be a good plan to take up some other occupation while he still is in the young, impressionable, adaptable age.

He has been engaged in the foundry business for the trifling period of 60 years and naturally may have been apprehensive that if he stays at it too long, it may get such a grip on him that he will have no desire to give it up in favor of any other. Young fellows are like that. However, those who know E. E. best entertain no doubts on the subject. A foundryman he always has been—well, at least as far back as *they* can remember—and a foundryman he will remain to the end of the chapter.

There is a vague tradition to the effect that he cast the first malleable iron hatchets and other *objets d'art* which the London Company tendered Big Chief Momanguin in exchange for the tract of land forming the site of the present city of New Haven. Also that he objected to the Indian name of the locality, Quinnipiak.

"Silly name," he declared "Future visitors to our Ah—anticipated—fair city never can decide whether to pronounce the name Quinny-peack, Quinny-pieack, Quinnippyack, Quin-nipeyack or Quinamoon comes over the mountain. Le's call the child—I mean the town—le's call it New Haven."

Old Eli and a few other boys prophetically peering into the future and seeing bands of students marching down Chapel Street singing, "Ale, Ale, The Gang's All Here," suggested Y'aletown as a suitable title for the future city, but they lost as usual.

The foregoing traditions have not the slightest foundation. As a matter of historical interest, New Haven was quite a respectable size city—in case you should be asked—when the future prop. of the G. F. Warner Mfg. Works, arrived one balmy day in June, 1852. Early as he was on the ground, the plant had preceded him by a few years.

The G. F. Warner Co., was organized in Straitsville, Conn., in 1848 for the purpose of conducting a malleable iron foundry, one of the first in the country. The product was confined principally to vehicular hardware. In the early fifties the company moved to New Haven where a small plant was erected containing a single air furnace for the manufacture of malleable iron castings. The roof of this furnace was flush with the floor. Combustion was induced by natural draft and the molders dipped the metal from the bath instead of catching it in a ladle under a spout.

Tradition says there were real men in them thar days. Men with hair on their chests. Here we have a manifestation of the well known law of compensation. Certainly a man dipping molten iron through the roof of a furnace could not hope to retain any vestige of a hirsute growth on his arms or legs.

However, that is neither hair nor theer—no, no—neither here nor there. Apparently the men were competent and the methods satisfactory as attested by several medals still in the company's possession. In 1865 the American Institute of New York awarded the company a silver medal in recognition of the excellence of its malleable castings. A second silver medal was awarded in 1868 when the company exhibited its product at the Maryland Institute for the Promotion of the Mechanic Arts. In the same year the company displayed its product abroad at the Exposition Universal in Paris and was awarded a bronze medal by Napoleon III. Manufacture of malleable iron was discontinued in 1890.

"Yes, yes," you say, impatiently, "but where is brother Durant all this time? Is this a story of the G. F. Warner Manufacturing Works or a story of E. E. Durant, proprietor, owner and manager?"

Softly, dear reader, softly. The story of one is the story of the other. The story of the plant and the story of the man are so closely intertwined that to separate one from the other would present practically the same problem as an ill advised attempt to separate those other well known alloys: Ham and eggs, half and half, day and night, blood and water and Amos 'n Andy.

Edgar E. arrived in New Haven on or about the same date as the G. F. Warner Co., but he held aloof rigidly for several years. In fact he carelessly ignored all classes of industry until he had arrived at the mature age of 13. That year marked the close of the Civil war. Dreams of adventure and military glory went glimmering. Our hero accepted the first job offered. He became apprenticed to a tailor and worked at that occupation for four years. Chaotic conditions following the cessation of war led him to seek other form of employment.

On April 1, 1871 he joined the staff of G. F. Warner Co., as office boy, book keeper and shipping clerk and for the faithful performance of his manifold duties he was remunerated to the extent of one dollar, coin of the realm, legal tender, for each and every day. He was advanced successively to the positions of secretary, manager and president. As with the famous old soldier: "He studied up economy and put away his rocks, so that he always had tobacco in his old tobacco box." Which is another way of saying that by 1900 he was in position to buy out the interests of all other members of the company and become sole owner, a position he still holds.

It isn't looking for Trouble-

It's only good business to guard against turning out defective castings.

YOU'VE heard foundrymen say "Why think about defective castings? You turn out lots of good ones to every one that's bad. It's only looking for trouble to worry about occasional defects."

But how dangerous those defective castings are when they *do* show up in your customer's shop! Especially these days when every foundry is trying to keep what business it has, and is making every possible attempt to satisfy customers and satisfy them right. Defective castings are one fine way of *not* satisfying your customers.

It's easy to make sure, though, that all the castings your foundry produces will be dependable. How? Include a percentage of Superior Charcoal Pig Iron in the mix. That makes castings stronger, tougher, longer lasting, more uniform, easier to machine. And it results in less scrap loss, far fewer rejections and more profit to you. So include at least 15% to 20% Superior Charcoal Pig Iron in the castings you turn out.

It isn't looking for trouble to insure against defective castings. It's only good business—like insuring yourself against fire, accidents and bad accounts. And when you bid on castings, explain to the buyer how Superior Charcoal Iron in the mix benefits *him*.

YOUR CASTINGS *made with Charcoal Pig Iron have*...GREATER DENSITY · ADDED TOUGHNESS · MORE STRENGTH · LESS SHRINKAGE · LESS SCRAP LOSS GREATER UNIFORMITY EASIER MACHINABILITY ...*and you get higher quality finished products.*

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Grand Rapids, Mich.
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Superior Charcoal Pig Iron

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

MANY methods are employed for making metal gate patterns. The method adopted in any given instance depends on local conditions, the size, shape and location of the pattern, the molding equipment available and the number of castings on the order. Elaborate equipment perfectly justifiable for a great number of castings, would be too expensive where only a small number, or a single casting is required.

Where a brass gate is desired for use on a pattern plate, a wood pattern usually is made. A mold is made from this pattern in the usual manner and the casting afterward is finished and fitted in place, there to remain permanently as part of the pattern layout.

Aluminum or white metal usually is employed to form the gate pattern for a set of patterns that are molded periodically but which never are ordered in sufficient quantity to justify the making of a pattern plate. A gate of this kind readily is made without the initial expense of making an original wood pattern.

The patterns are arranged on the rollover board in the desired position and a mold is made in the usual manner. After the cope is lifted off the molder forms a channel for the runner and the branch gates in the joint face of the drag, or, in some instances, in the cope. Under certain conditions the runner may be cut in the cope and the gates in the drag. Details in connection with this choice have been described previously.

Irrespective of where or how the gates are cut, the patterns are not removed from the sand at this stag. A small impression for a knob or bos, is formed in the cope face to serve as a guide on the finished gate for setting the sprue. Where the gate is to be used on a rollover board this is omitted and a small hole is drilled—or cored—in the gate to locate the end of the sprue. However, since the majority of small molds are made on pattern plates and furthermore since the common practice is to form the sprue by shoving a small tube through the cope from the face to the back, the small knob or boss serves the molder for a guide in locating the sprue.

Coming back to the method employed in molding the gate pattern for an odd lot of castings, a small rod or piece of wood approximately the size of a lead pencil is centered in the boss impression and then shoved through the sand of the cope to form a sprue opening. This opening is flared at the top to some extent to facilitate entrance of the metal from the ladle.

Usually the white metal, an alloy 50 per cent tin and 50 per cent lead, is melted in an iron pot and poured directly from the same pot into the mold. This metal has a low melting point and the surplus metal readily is absorbed in the routine practice of the shop, in making up charges for ounce metal or other alloys containing tin and lead.

Pouring temperature of the metal is determined by inserting the end of a piece of pine or other soft wood in the bath. If the wood flames, the metal is too hot. It is allowed to cool to a point where it does not discolor the surface of the wood. At this stage the metal is poured into the prepared mold. The metal at the ends of the gates comes into contact with the wood patterns, but does not burn them. The shellac in the vicinity will be scorched and roughened slightly, but this easily is remedied with a piece of sandpaper and the application of a dab of shellac. The

Make Gate Patterns

EVEN when an order is comparatively small and a number of patterns, either duplicates or miscellaneous items, are placed on a board and rolled over in a drag, economy of operation may favor the use of a metal set gate. This gate can be made from a white metal mixture at little or no expense and may be remelted if advisable after it has served his purpose.

The basically sound theory of equalizing the cooling speed all over a casting is followed in the practice of pouring the metal into the blades of propeller wheels rather than into the hubs. This applies particularly to large wheels where the shrinkage and contraction assume real proportions. A full size extension to the hub is the best type of feeder.

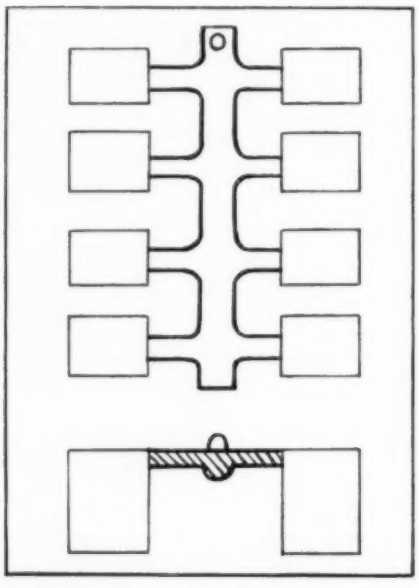


Fig. 185—A small knob on the gate locates the sprue

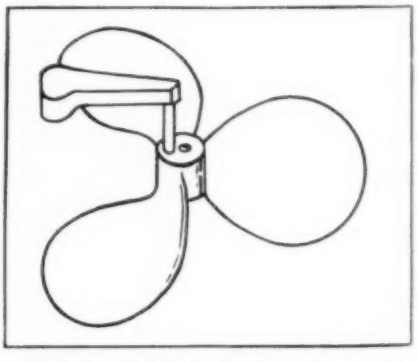


Fig. 186—Method of gating a small propeller on the top of the hub

white metal gate pattern is removed from the mold and with little or no finishing it is ready for use on succeeding molds.

In some of these gates a wood plug is placed in the runner cavity where it is surrounded and anchored by the metal. This plug is placed at a point where the gate will *balance*. The sharp end of a draw spike is inserted in this plug when the molder desires to remove the gate pattern from the mold. This device of course is not necessary where the gate pattern is attached to a pattern plate.

Use Harder Metal

Certain conditions may determine the use of a harder metal for the gate pattern. An alloy that finds wide acceptance contains tin 45 per cent, lead 45 per cent and antimony 10 per cent. In making this alloy the lead is melted first and raised to a red heat. Then the antimony is dissolved, after which the tin is added. If copper is added to make a red metal, the amount of antimony should not exceed 1.5 per cent. If the standard 85-5-5-5 alloy is used, the tin content may be cut in half where 1.5 per cent antimony is incorporated in the mixture. The antimony reduces the strength of this metal, but strength is not an important factor in patterns.

Apparently small and simple castings sometimes present defective areas where nothing of the kind is anticipated. Off hand a foundryman would be inclined to say that no particular care, or no special type of gates is required for the successful production of red brass mud plugs for locomotive boilers.

In one typical instance selected for illustration, the pattern equipment consisted of aluminum plates containing 10 plugs to a mold. The runner was in the cope and the gates were in the drag and filleted at the junction. The castings were poured from the standard 85-5-5-5 alloy made from selected scrap, first melted, then ingoted and analyzed and brought up to standard in subsequent remelting. The metal was fluxed with borax, covered with charcoal in the ladle and poured at a temperature of approximately 2100 degrees Fahr. Cavities of undetermined origin appeared in these castings when they were machined.

Inspection of two sample castings showed that the metal was clean and solid, indicating satisfactory melting practice, thus eliminating this factor from the problem. Further examination disclosed the fact that the gates and runner were entirely too small to fulfill the double function—in this instance—of gate and feeder. The cavities were caused by liquid shrinkage which continued after the metal in the gates had solidified. In this instance the apparent remedy was to increase the size of the gates, even

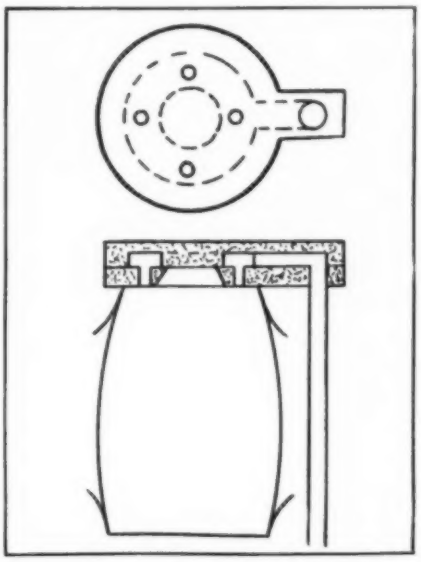


Fig. 188—In this method the metal enters the bottom of the hub

though it involved melting additional metal for each mold.

Specialists in any subject hold one characteristic in common. They disagree partly or in *toto* with the opinions of their colleagues, although in the majority of instances they present a united front to those outside their profession. Thus two marine engineers will differ in opinion of whether the pitch or the rake of any given propeller is responsible for the lack of efficiency, but both will concur heartily in the opinion that the designer probably received his training in a wheelbarrow shop.

The foundryman is not consulted in the design of the propeller. His job is to produce a casting that will conform accurately to the drawing or the pattern submitted. The mold is made in green sand, dry sand or loam depending on the size of the wheel, on the shop facilities and on the pattern equipment. The size and the location of the gates in many instances exert a direct influence on such important features as shrinkage, contraction, strain, and sharpness of outline, particularly on thin wheels with feather edges. Since foundrymen also are specialists it is only natural to find that divergence of opinion also is found in the methods of gating adopted in the production of propeller wheels.

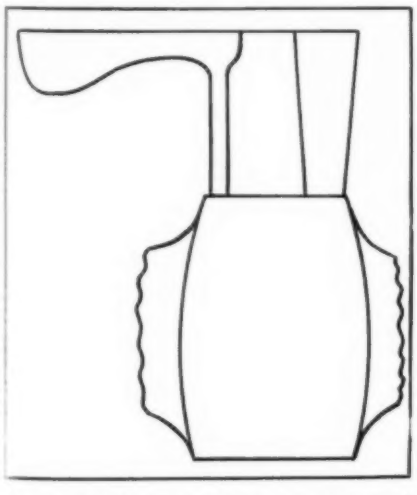


Fig. 187—Usual style of gate and riser on a propeller hub

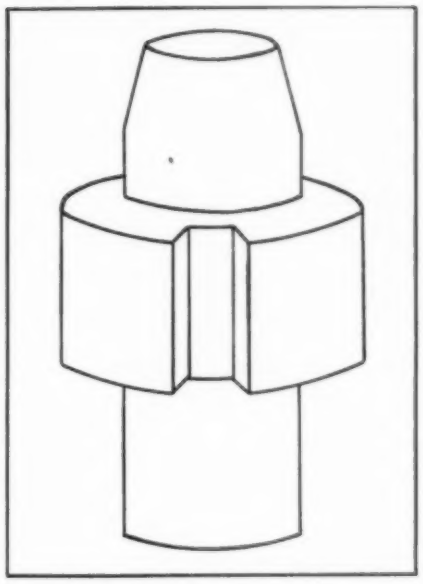


Fig. 189—A gap in the chamber core provides extra metal for the keyway

A satisfactory method of gating small wheels is shown in Fig. 186, with the single exception that this, and practically all other wheels, are molded in the opposite position, that is with the driving face in the drag. However, that is only a minor detail, since these castings are polished on both faces and therefore must be clean and solid throughout. The slight additional trouble involved in molding wheels face up is encountered only on the large sizes.

On small wheels up to 60 or 70 pounds the small pop gate on top of the hub will serve satisfactorily with many brass and bronze alloys. This style of gate is not recommended for use with manganese bronze, the material employed for high grade propeller wheels. In addition to a change in the style of gate, a feeding riser as shown in Fig. 187 will be required on manganese bronze castings.

Stream Develops Dross

Manganese bronze is a peculiar metal and must be introduced into a mold without agitation. The ordinary type horn gate will not serve since it is smaller in diameter at the point than it is where it merges into the sprue. This shape produces a nozzle effect on the stream of metal entering the mold particularly where it impinges on a center core. The

result is the production of a metallic lather or dross which floats into the wing cavities and produces an unsightly surface, or, remains in the hub to show up as a spongy area when the center hole is machined for the shaft.

Advantage of bottom pouring plus the avoidance of the jet or nozzle effect incident to the use of a single horn gate may be secured by the adoption of the gate shown in Fig. 188. The only special equipment required for this type of gate is a pair of small dry sand cores, a trifling insurance to pay for a perfect casting.

These cores are not entirely circular. A projection at one side contains a passage leading from the sprue to a circular runner in the upper core as shown in the illustration, which shows the pattern in the drag before it is rolled over. Obviously the entire assembly will occupy an inverted position before the metal is introduced.

The lower core, that is the core resting on the hub, is pierced by four or more small gate openings. The size and number of the gates will depend on the amount of metal to be poured through them. Also, the gross cross sectional area of all the gates must exceed the cross sectional area of the runner to insure gentle entrance of the metal into the mold. The lower core is located in place by the bottom core print on the propeller pattern. Later of course, the cavity in the core locates and supports the center core in the hub of the mold. Where the pattern is designed to be cast with a solid hub the core may be provided with a small recess to fit over the bottom of the hub pattern. Personal preference on the part of the molder will dictate whether the two cores should be pasted, or, simply placed in position, one on top of the other.

Method of preparing the mixture sometimes is responsible for dirty castings, therefore it is of interest to note that the usual mixture is made up of 60 per cent copper and 40 per cent zinc with 2 pounds manganese copper, 1 pound iron and ½-pound aluminum to each 100 pounds. The best method of adding the iron is in the form of tin plate clippings coiled or pressed. The addition is made after the copper is melted. This material is stirred quickly into the bath, then the aluminum is added and the temperature of the mixture is allowed to rise. The zinc is added last.

Hubs of all medium and large size wheels are chambered in the center, partly for the purpose of equalizing the metal thickness in this section of the casting and partly to reduce the cost of machining the bore. A gap is left in the center core to provide metal back of the key seat as shown in Fig. 189.

Advantage is taken of this feature in top cast wheels to locate the gate immediately above this gap in the core. More properly speaking, the core is placed in the mold in such a manner that the gap in the core comes in line with the gate in the cope. This arrangement insures a straight drop for the metal in the early stages of filling the mold and prevents the metal from spattering off the projecting part of the hub core.

While it is true that many large propellers have been cast through gates either at the top or the bottom of the hub, the writer favors a method by which the metal enters the mold through a number of pop gates located between the hub and the extremities of the blades or wings of the wheel. An elementary sketch of this method with all extraneous features omitted is shown in Fig. 190.

Practically the only objection to this method of arranging the gates is that it involves the construction of a rather elaborate runner basin on top of the cope. However, in actual practice it will be found that little more equipment and time are required than where an ordinary straight runner is made up to extend from the outer edge of the mold to the gate or gates on top of the hub.

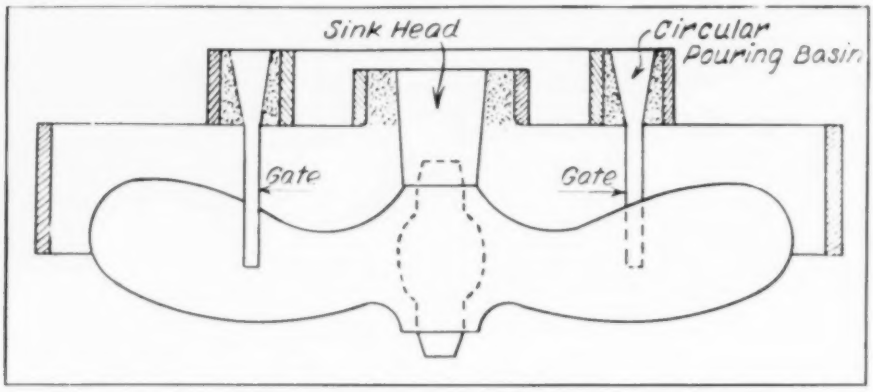


Fig. 190—Metal from a circular pouring basin enters the mold through one or more pop gates on each blade

The principal advantage of the gating method shown in Fig. 190 is that it introduces the metal into the mold according to sound theoretical principle. The hottest metal enters the wings and flows toward the hub where the thickness is greatest. Irrespective of what method is adopted, the blades, particularly the outer ends, will solidify before the hub. This action is bound to affect the structure of the metal at the junction of the blade with the hub. By synchronizing—as far as possible—the speed of contraction in the blades and hub, the danger of segregation or unsatisfactory grain structure in the junction area is prevented.

Only one pop gate on each blade is shown in the illustration, but it is readily apparent that where conditions warrant, this number may be increased with the gate openings arranged either longitudinally or transversely. The circular runner basin is made up between two comparatively shallow rings, curbing, pulley rings or patterns, or two circular drags may be pressed into service. This feature presents no particular difficulty and may be left to the ingenuity of the molder.

Another advantage of the foregoing method of gating is that the hub of the wheel may be extended upward to any desired height to serve as a feeder.

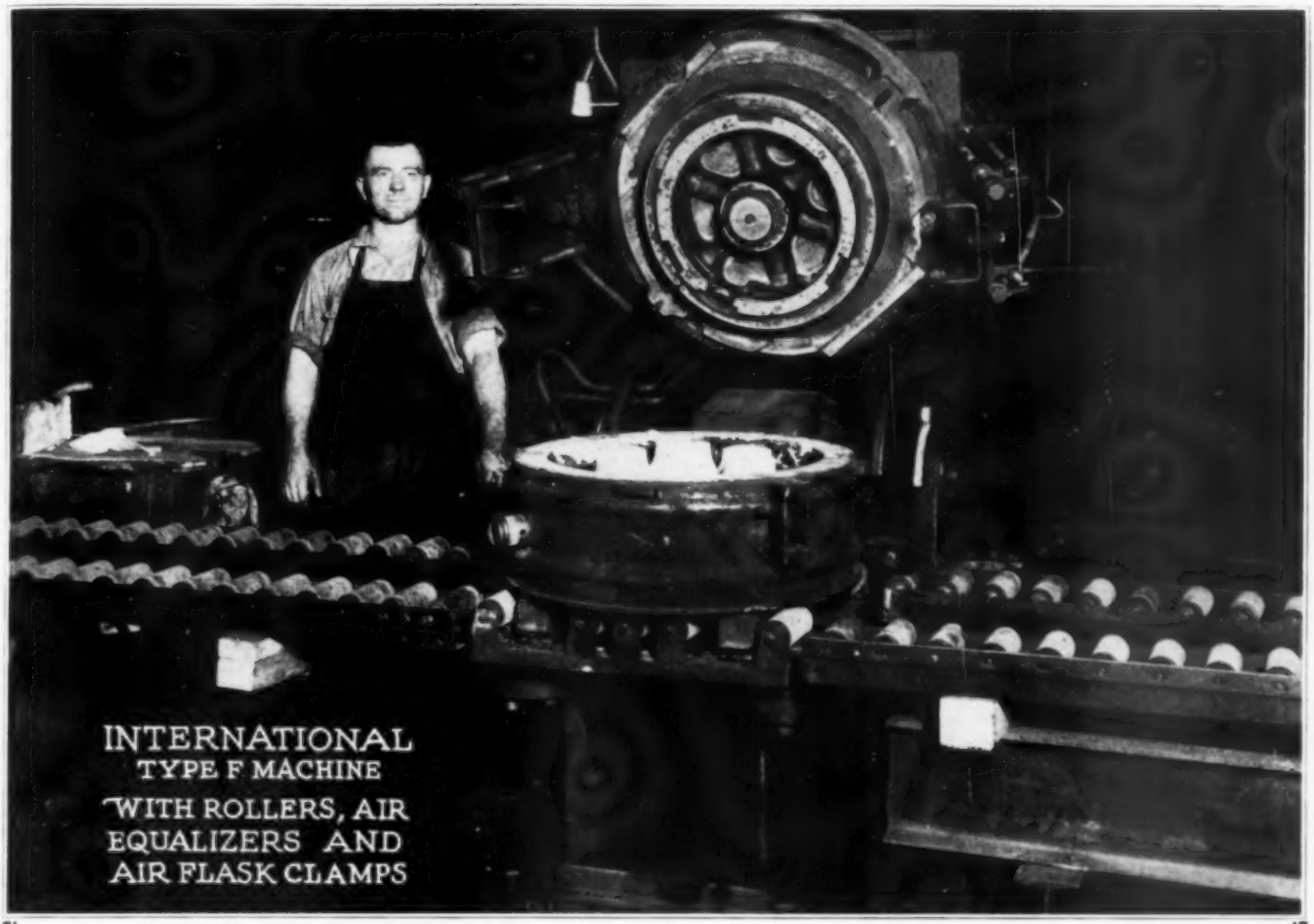
This is the thirty-sixth of a series of articles dealing with the various types of gates and risers used in the foundry industry. The thirty-seventh installment will appear in an early issue.—THE EDITORS.

Engineers To Study Lubrication

In a paper before the annual meeting of the American Society of Mechanical Engineers, Thursday, Dec. 8, 1932, in New York the chemical mechanism of lubrication was discussed by William F. Parish and Leon Cammen, whose introductory paper on the subject in June, 1932, attracted wide attention not only in this country but abroad.

Lubrication as such is essentially a chemical phenomenon, and a vivid light on its mechanism has been thrown by recent progress in physical chemistry generally, and its most novel branch, surface chemistry, in particular. At the meeting when the paper was presented, a demonstration of the new Sperry-Cammen tester was made, operating up to its top speed of 20,000 revolutions per minute.

Work is in progress by the bureau of the standards on the effect of controlling super-heating prior to casting as a means of modifying the structure and improving the mechanical properties of cast iron.



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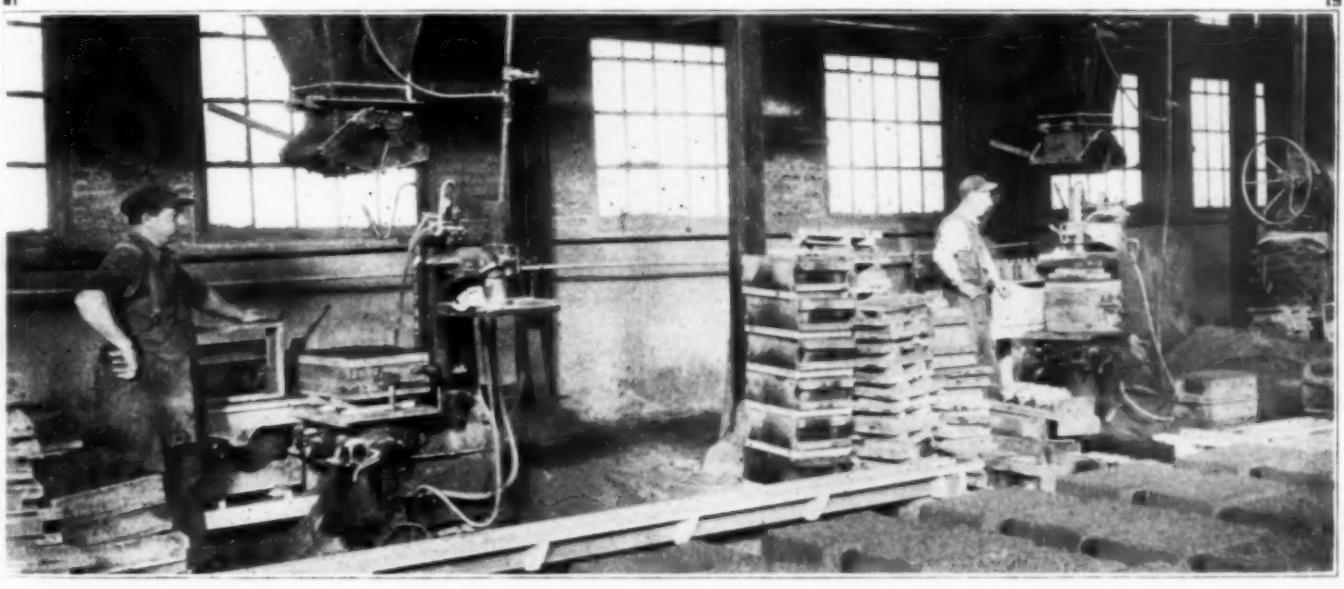


Nonferrous Melting at Mare Island

Two batteries of gas fired, crucible furnaces are employed for soft metals

By J. B. NEALEY

American Gas Association

ONE of America's greatest havens of protection in times of war is the Mare Island navy yard, base of operations, supplies and maintenance for the Pacific fleet, located at Vallejo, on San Francisco Bay, California. This great naval base is equipped completely with building ways, cranes, yards, dry docks, machine shops, foundries, etc., for the building and maintenance of war ships. The foundry in which practically all of the metals are melted and poured, including iron, brass, monel metal, etc., is of particular interest. In addition to making castings in sand, centrifugal casting machines also are used.

The foundry is housed in a brick and steel building 100 x 500 feet, including the center and two side bays. The middle bay is the larger and is served with 20, 15 and 10-ton overhead cranes, each with a 60 foot span and a 5-ton quick hoisting hook. Three cupolas, a reverberatory furnace, a tilting type melting furnace of 5000 pounds capacity and four smaller tilting type furnaces are located in a lean-to on the north side of the building. Castings up to 20 tons in weight are poured.

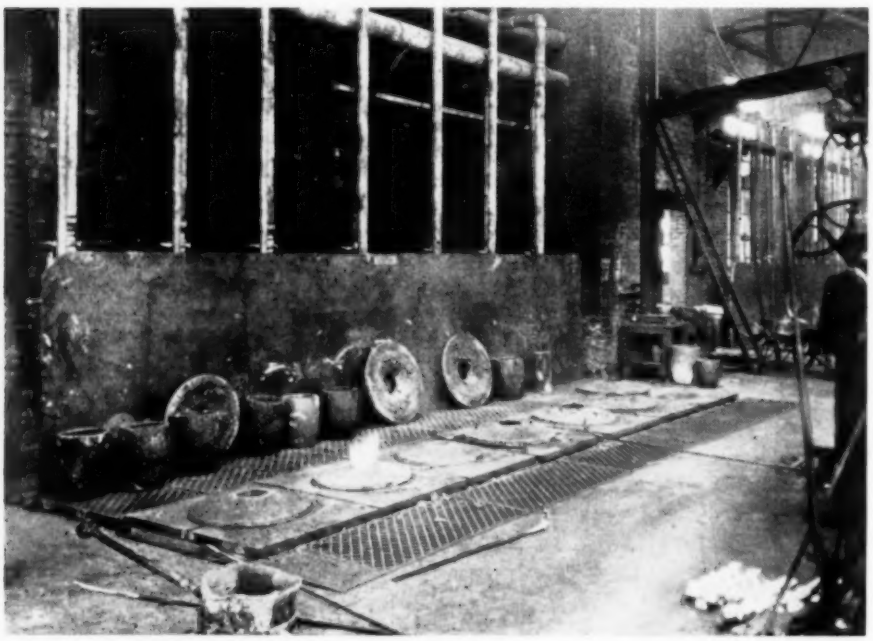
A spur railroad track enters at the east end of the building where the cleaning department, which has two of the latest type combination tumbling and sandblasting machines, individual motor driven double headed, grinders, tumblers, shears and saws for cutting gates and risers, etc., is located. Bench and machine molding is carried on in the south bay, and core making and metal melting in the north bay, while most of the middle bay is given over to molding and pouring castings.

Two centrifugal casting machines are of different types, horizontal and vertical. Molds are rammed up in cylindrical liners, perforated and grooved to allow the escape of gases. The liners are inserted in large diameter sleeves or casings that revolve on roller bearings, and which are connected directly to individual motors. When a mold is prepared properly and baked, it frequently is possible to obtain 12 castings from it, before it deteriorates. Weight of the casting and thickness of wall are controlled by predetermining the weight of the charge being poured. Considerable success has been attained with the machines, which give a fine, homogeneous grain to the castings. This is especially true of monel metal valves, seats, liners, bushing, etc.

Recently two batteries of crucibles for soft metal melting have been installed and these are heated with gas fuel. These batteries set in two pits, one holding eight No. 200 crucibles and the other seven crucibles of which three are No. 80, three No. 125 and one No. 200. The pits located in the north bay of the foundry and lined with brick, are 11½ feet wide and 6 feet deep and 22 and 27 feet long respectively. Two steel boxes, each 12 feet long and 3 feet square in cross section set in each pit. The crucible furnaces built within the steel boxes are of high grade firebrick and insulating material and each furnace holds a single crucible. The spaces on both sides of the furnaces are utilized respectively for firing apparatus and for catching the molten metal in case of crucible failure. These spaces are covered with cast iron gratings. A jib crane with air hoist is used to remove the crucibles, which are carried by hand to the flasks.

Gas and air for the furnaces are supplied through two large steel manifolds hung on the outside of the building wall with take-offs through the wall for each burner. The low pressure gas pipe is 8 inches in diameter and connects with the main gas line while the air line is 16 inches in diameter and connects with two motor driven blowers, each capable of furnishing 1800 cubic feet of air per minute at 1½ pounds pressure.

Each of the furnaces, except those with No. 80 crucibles, are provided with two gas burners. The burners are of the tunnel type with low pres-



Battery of gas-fired crucible furnaces in Mare Island navy yard foundry

sure inspirators and adjusted so as to provide the correct air-gas ratio. The burners fire into the furnace tangentially to the inside wall, the hot products of combustion swirling around the crucibles in such a manner as to equalize the temperature throughout and produce a temperature of 3000 degrees Fahr.

A unique piece of equipment in this foundry is a three purpose oven or furnace which is used to dry molds, bake cores or for annealing manganese bronze propellers. This oven is of brick, lined with insulating plaster and is 11½ x 16 x 22½ feet. Annealing is accomplished by heating at 800 degrees Fahr. for 4 hours. The oven has a single, counter weighted door with a pneumatic lift.

The oven burner, of unusual construction, was designed especially for it and sets on the floor of the oven at each side. Each burner consists of three steel boxes, 4 x 12 inches x 5 feet placed end to end. Each steel box contains three rows of 25 holes, and in each of the holes a lava tip burner is screwed. The proper mixture of air and gas is fed into the long composite burner through 3 inspirators; one on each box. A duct below the burner provided with multiple ports, supplies secondary air for combustion. A pipe, 1¼ inches in diameter with a series of holes is located in front of the burner tips and serves as a pilot light for the oven burner.

The oven is equipped with an automatic temperature control which maintains any degree of heat desired by mechanically increasing and decreasing the volume of fuel flow to the burner. The oven also can be stopped or started automatically at predetermined times without the attendance of an operator.

Covers Sand and Clay

The second number of the new quarterly journal, *Sand Clays and Minerals*, published by Algernon Lewin Curtis, recently has been issued. Included in the information presented is the second section of an article entitled "A Simple Way to Analyse Clay," a discussion of "Fuller's Earth" by James H. Taylor, an article on "Some Little Known Uses of Clays" by Alfred B. Searle and a discussion of "Nimol, A New High Alloy Cast Iron" by Edwin Walker. The latter describes an iron heavily alloyed with nickel, copper and chromium.

G. J. Sturmfelsz has been appointed representative of the Falk Corp., Milwaukee, in the Baltimore district with offices at 1620 East 32nd street, Baltimore. H. Douglas Stier has been representative of the Atlanta territory with district offices at 101 Marietta street, Atlanta.

Uses Linoleum To Build Up Patterns

Often, when it is necessary to change a pattern slightly, considerable expense and time may be saved by building it up with scrap linoleum to the required dimensions rather than making a new pattern. Many patterns needing a slight change in diameter are changed easily in that manner.

Quick changes may be made with the aid of linoleum

Changes necessitating building up of the pattern are encountered when it is desired to cast steel from a pattern designed for cast iron, or for casting iron from a pattern designed for brass. Also, when it is desired to make a gear with an additional tooth from a standard pattern, linoleum is useful.

The accompanying illustration shows the use of linoleum on a 120 inch gear pattern at the Nuttall plant of the Westinghouse Electric & Mfg. Co.

Book Review

Apprenticeship, by Stewart Scrimshaw, cloth, 273 pages, 5¼ x 8 inches, published by the McGraw-Hill Book Co., Inc., and supplied by THE FOUNDRY, Cleveland, for $2.50 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton House, Westminster, London.

The increased interest in apprenticeship during recent years and the greater attention which is paid the teaching of vocational subjects in public schools provide an interesting background for this textbook on apprenticeship and co-operative part-time education. In studying the philosophy of apprenticeship relations, the author has reviewed the meaning of apprenticeship in its relation to modern industry, labor, the employer, formal education and the fluctuations of the state itself. Information is presented on new manifestations of apprenticeship in the form of co-operative training and problems encountered in the administration of the Wisconsin plan are included as illustrations of principles and procedures which must be recognized if a thorough knowledge of industrial training is to be obtained.

The author is particularly fitted to write on the subject of apprenticeship, because his career began as an apprentice to the bricklayers' trade in England. After obtaining a university education he became state supervisior of apprenticeship in Wisconsin, later personnel administrator in a large machinery manufacturing corporation then director of engineering co-operative relations between a university and the manufacturing establishments of a large city and finally professor of personnel administration and economics of that university. In addition to holding the interest of vocational educators and educational and economics departments of colleges and universities, the book will be of value to personnel executives, company officers and leaders of labor organizations.

Approves Practice For Foundry Patterns

A new recommended practice for foundry patterns of wood, designated as B45.1-1932, has been approved by the American Standards association. The standard was submitted by the American Foundrymen's association, which has been appointed joint sponsor for the project with the American Society of Mechanical Engineers. The new standard was developed by a committee consisting of two members each of the American Foundrymen's association, the American Society for Testing Materials, the Steel Founders' Society of America, the National Association of Pattern Manufacturers, and the American Institute of Mining & Metallurgical Engineers. The standard was approved in 1930 as a commercial standard, known as CS 19, by the bureau of standards and reprinted without change in 1932.

Made Distributor

Moore-Handley Hardware Co., 25 South 20th street, Birmingham, has been appointed distributor in the Birmingham territory for the entire line of elevating, conveying and power transmitting machinery manufactured by the Link-Belt Co.

J. J. Donovan, manager, air conditioning department, General Electric Co., New York, recently was elected a director of the American Oil Burner association.

Institute Covers Wider Field

Committee reports at New York meeting shows greater service without increased expenditure

PROGRESS in technical research and selling of gray iron castings has been steady, despite depressed business conditions. These facts were brought out at conference of members of the Gray Iron institute at the Waldorf-Astoria hotel, New York, Nov. 17. J. L. Carter, vice president of the institute, Newark, N. J., presided, the brief sessions being held on the final day of the 36th annual convention of the National Founders' association.

Arthur J. Tuscany, manager of the institute, told of efforts of the merchandising committee and the issuance of a bulletin on the relative value of castings and welding for certain types of work. Engineering properties of gray iron have been clarified by the work of the committees during the year. Mr. Tuscany stressed the availability of the technical department of the institute to all members, urging them to make use of it. He also urged members to give special attention to new uses for gray iron castings and outlined plans for a handbook, a sales manual giving all information on castings resulting from the work of the various committees, this handbook to be given wide publicity and circulation among users of castings.

H. S. Chafee, Builders Iron Foundry, Providence, R. I., reported for the finance committee, indicating that more ground has been covered by the association, without increased expenditures.

Specifications Important

H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y. chairman of the technical committee, stressed the importance of the new specifications under the various classifications adopted by the American Society for Testing Materials. These specifications and their acceptance are elevating the standards of gray iron castings as illustrated in a survey of the individual foundries. New properties of gray iron should be given wide publicity, Mr. Hanley stated, and used as a basis of merchandising campaigns. Such data should be available readily to designing engineers that they may be familiar with latest developments in gray iron specifications. In technical sales work in connection with local chapters the new specifications should be of value. Technical committees have been organized in 12 chapters of the institute.

Fred Erb, president, Eaton-Erb Foundry Co., Detroit, outlined benefits through the new institute insurance plan, stating this plan had met with general favor.

John L. Carter

John Carter favored a more extensive use of the institute's cost system and the cost service available to members. He also urged quarterly meetings of local groups with the attendance of the cost consultant of the institute.

During periods of depression industry makes its greatest progress for it is during that time that the greatest technical improvements are discovered, declared Charles F. Abbott, Executive Director of the American Institute of Steel Construction, in an address before the Gray Iron Institute meeting. This is true of steel construction and certainly must be true of other industries. For this reason, the speaker said, we may reasonably expect industry to soar to new heights of prosperity once the trend from the trough of the depression is upward again.

In steel construction builders are expecting to apply to the erection of residences some of the great improvements which have proved feasible in the building of skyscrapers. During the past few years there have been many attempts to build houses of steel, thereby insuring not only a fire-safe structure but one that will not shrink or deteriorate. Methods have been developed which warrant the industry to believe small houses of steel framing can be built at no increase in cost over other types. Early in the new year handbooks of instruction to builders of residences will be issued by the leading steel mills.

New inventions in air conditioning, improved methods of heating and lighting, better walls and floors of steel, resulting not only in better buildings but cheaper structures, will rapidly render existing buildings obsolete once the demand for space is again felt. All of these great improvements will be thrown upon the market with the general upturn in business and they will aid the steel industry to drive ahead again to still higher levels of prosperity than anything experienced in the past.

Requires Full Co-operation

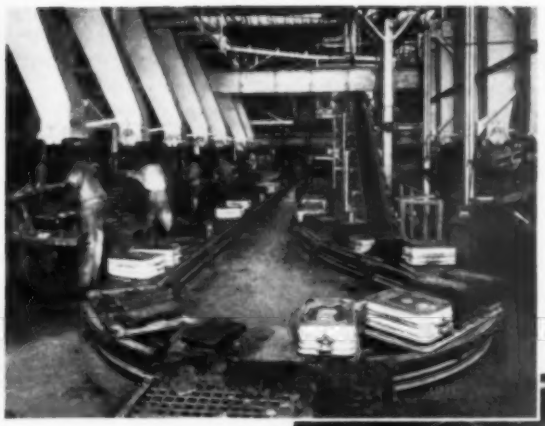
To obtain the full benefits of these improvements, however, and to make them available to the public, said Mr. Abbott, requires the fullest co-operation. Industrial co-operation will be the chief influence motivating trade recovery. Mr. Abbott said:

"The world is rapidly advancing to a new order of society. In business the individual leader is being replaced by the well-motivated group. The captains of industry are being replaced by well-managed trade associations. Our affairs have grown so huge, so closely integrated, that we are finding it impossible to operate under the leadership of a single personality. No one individual is so inspired that he can give adequate study to the innumerable and immense problems presented daily by business for solution. And so the group, intelligently and resolutely animated by a common purpose, is bringing to the front a new business leadership.

"Co-operation is the method by which the group mind finds the way to future progress. And fortunately for all the world, we appear to be moving toward more co-operation

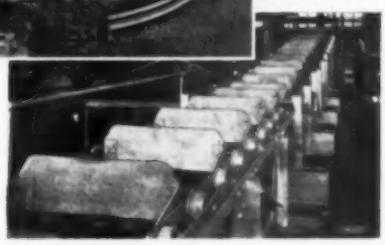
(*Concluded on Page* 48)

Trolley Conveyors



Mold Conveyors

Belt Conveyors



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Cut Your Costs with these Jeffrey Units

Any one of these Jeffrey Units pictured here will cut your Foundry costs materially.

Mechanical handling saves floor space, molders' time and flasks required, and effects many other economies. The extent of these savings is vitally affected by the type of equipment selected.

The Jeffrey line of mechanical handling equipment for foundries—both large and small—is complete. The list includes:

Conveyors: Apron, Belt, Flight or Scraper, Flask, Mold, Castings, Trolley

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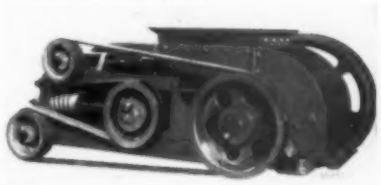
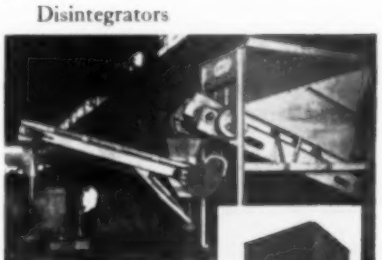
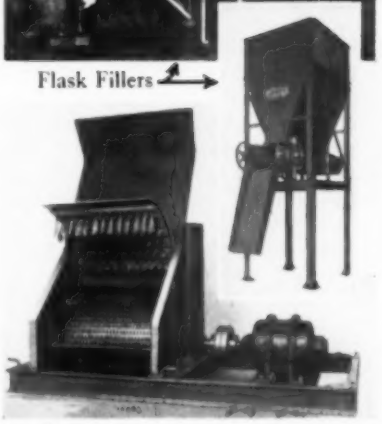
Sand Reclaiming and Conditioning
Portable Loaders
Crushers and Pulverizers
Bins and Hoppers
Chains, Wheels and Buckets
Transmission Equipment
Screens—Fans—Mixers—Aerators



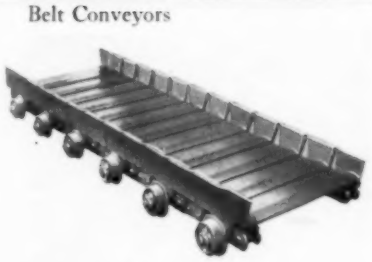
Disintegrators



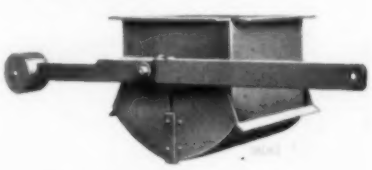
Flask Fillers



Aerators



Leak-proof Apron Conveyors

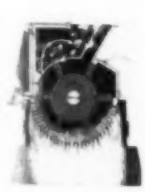


Foundry Type Valves

Sand Mixers

Screens

Portable Belt Conveyors



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(*Continued from Page* 46)

every day. Our industrial problems are most of them too big to be met by one man. But by group mind and group action all our problems in business can be solved.

"If we are to profit from the costly experience of the past we should recognize what honest co-operation can accomplish, not only for business, but for the peace and happiness of all peoples throughout the world.

"The shifting in economic laws has brought about unusual conditions affecting all industries. New problems have called for co-operative organizations that the interest of each industry might be safeguarded. Those who have heeded the call have profited, while those who have hesitated are still experiencing the ill effect of those new conditions.

"Industrial associations are not only essential in promoting progress, but they are a necessary benefit to members, to customers and to the public. Most of the problems that confront the individual business man are shared equally with his competitors, his customers and the public. He cannot solve them alone. Success will depend upon the co-operation of all interests involved."

Complete Record Is Aid to Efficiency

By O. S. Pine

Discussing an announcement that a certain foundrymens' association had adopted a uniform set of trade customs, a prominent foundryman expressed the hope that the custom would be adopted uniformly in the foundry industry. He dwelt particularly on the importance of marking patterns in a manner to render identification easy. He favored stamping the individual name of the piece on each pattern.

He operates a general jobbing combined iron and steel foundry and instances the case of one of his principal customers to illustrate the difference between patterns that are numbered and marked in an intelligible manner and those that are marked merely by a serial number. The customer operates three branch factories each provided with its own pattern shop and machine shop In plants No. 1 and 2 all patterns, coreboxes and loose pieces are stamped with a serial number. This number with the name of the pattern and a list of pieces, if any, are entered in the pattern record book. When the pattern is sent to the foundry it is accompanied by a written order bearing the foregoing information.

After the order is completed the patterns, coreboxes and loose pieces are stored among approximately 1500 other patterns in that section of the pattern storage building devoted to this particular customer. When a second order is received probably a year later no trouble is experienced in finding the pattern, because the order bears the serial number, the name, the number of loose pieces and perhaps most important of all, the weight of the casting. The man sent in search of the pattern has a fairly definite picture in his mind.

Contrast the foregoing with the method practiced in plant No. 3. The order simply stipulates that the foundry supply a certain number of castings from pattern No. 1499. Unless the pattern storage man is familiar with every single pattern in the building and unless he has a memory as comprehensive and infallible as an adding machine, it is apparent that he will lose a considerable amount of time groping around the various shelves before he finally locates No. 1499. The 1500 patterns in this customer's group represent castings that weigh from ½-pound to 5 tons. The pattern man does not know whether to look for a gear blank or a lathe bed He does not know whether it is one of the large patterns on the floor or one of a miscellaneous group of small patterns on one of the shelves.

The best pattern recording system that has come under my observation was that practiced in a shop where I worked many years ago. The customer's name was entered in a special book kept for the purpose. The name of the pattern and the serial number appeared under the customer's name and the distinctive feature of this system appeared on the same page. This was a free hand sketch of the pattern made by the pattern shop foreman. Armed with this information any person could find any designated pattern in a minimum of time.

A. S. M. E. Holds Metallurgical Meeting

Midcontinent section of the American Society of Mechanical Engineers held a metallurgical meeting in Tulsa, Okla, recently, where eight papers were presented covering a variety of subjects Among the papers were the following: "Selection of Material for High Temperature, High Pressure Work," by V. T. Malcom, Chapman Valve Co., Indian Orchard, Mass.; "Valve and Fitting Material for High Temperature, High Pressure Service," by H. W. Maack and J. J. Kantor, Crane Co., Chicago; "Metallurgical and Engineering Factors Affecting Return Bend Design," by John E. Getzen, chief engineer and metallurgist, Stockham Pipe & Fittings Co., Birmingham, Ala.; "Material for Pumping and Compressing Equipment in the Oil Industry," by F. B. Applegate and R. T. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.

Molding Practice Discussed at Meeting

An informal discussion of problems relating to molding practice which was participated in by John McGuigan, North Bros. Mfg. Co., Charles E. Schley, Philadelphia Bronze & Brass Corp., and George Leiner, Pennsylvania Lawn Mower Works, featured the regular meeting of the Philadelphia Foundrymen's Association held Nov. 2 at the Northeast Shrine Club, Philadelphia. B. H. Johnson, R. D. Wood & Co., Philadelphia, spoke on the sand spun processes of making cast iron pipe and H. Reitinger, U. S. Pipe & Foundry Co., talked on the centrifugal processes in the use of metal molds. J. B. Greenstreet, Olney Foundry Co., Philadelphia, and president of the Philadelphia association, presided.

Elects Officers Of Washington Group

Washington Foundrymen's club, Seattle, recently elected the following officers: President F. W. McKenzie, Webster Brinkley Co., Seattle, and secretary, Edward C. Gustin, 3716 Grayson street, Seattle. Meetings are held at 6:30 p.m. on the second and fourth Tuesdays of each month at the Exeter hotel, 8th avenue and Seneca street, Seattle.

Talks on Alloy Irons

Recent developments in special alloy cast irons was the subpect of a talk by F. B. Coyle, International Nickel Co., New York, before the regular meeting of the Detroit Foundrymen's association held at the Fort Shelby hotel, Detroit, on Nov. 17.

Frederick G. Selfing, Michigan State college, discussed the foundry short course which is being conducted by that institution.

Speaks at Pittsburgh

Robert C. Good, metallurgical engineer, Electro Metallurgical Sales Corp., New York, spoke at the regular meeting of the Pittsburgh Foundrymen's association at the Fort Pitt hotel, Pittsburgh, on Nov. 21. The subject for Mr. Good's talk was "Alloys for Foundry Purposes."

Form English Firm

Bristol Co., Waterbury, Conn., has established a British factory at London, England, under the name of Bristol's Instrument Co., Ltd. The plant is located at 144 Pomeroy street, New Cross, London.

Expedite Construction of Pulleys

(*Continued from Page 27*)

the upright pop gate in the center.

Many pulleys are cast solid, which means that they will remain and be handled as single units, one-piece castings, until the end of their useful industrial existence. The shaft must be inserted before the piece of machinery is erected and if later from any one of a hundred probable causes it becomes necessary to remove the pulley, it may be necessary to take down a long line shaft or disassemble a machine.

For that reason and occasionally because of problems connected with contraction strains a great many pulleys are cast *split*. Suitable lugs provided with prints for the bolt cores and splitting cores are attached to diametrically opposite points on the inside of the rim pattern and on the outside of the hub pattern. The prints are all located on the same diametrical line and the prints on the rim are designed to occupy a space midway between two arms.

After the mold is made and before the cope is placed on the drag, thin, flat cores are inserted in the prints provided for that purpose at the hub and rim of the wheel. The object of the cores is to cut the wheel in two, but they do not cut the mold in two. The thin, flat splitting cores are kept back varying distances from the face of the rim and from the center core. The distance depends on the size of the pulley and the amount of metal to be removed during the finishing operation in the machine shop. With this arrangement the metal fills the mold as a unit. The casting is a solid wheel. It is not split into two parts until after it has been partly machined. Then the two halves are bolted together. The hub is bored and the rim is finished, flat or crowned as required.

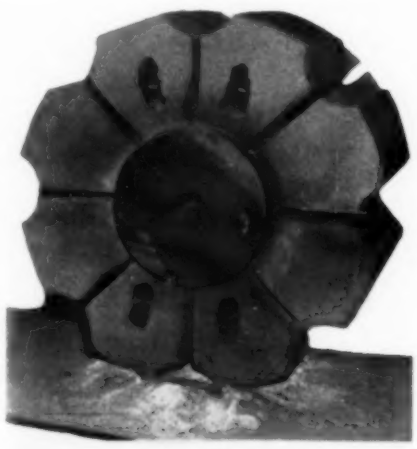


Fig. 7—The core is made in halves and jointed on the horizontal center line in the present position

Eliminate Hazards

THE accompanying description deals with the methods and equipment employed by the Hill Clutch Machine & Foundry Co., Cleveland, in the production of two lines of castings. The first, cast iron pulleys, enter into the construction of power transmission machinery, a field in which the company has taken a prominent part for many years. The second, a center casting for a special machine tool, is typical of a line of general jobbing castings made for outside interests. Both jobs selected for illustration present many features of interest and indicate how mechanical equipment and intelligent selection of sand for molds and cores have eliminated many former hazards of the foundry.

Obviously, a pulley in two parts can be assembled on a shaft in a minimum period of time irrespective of the position of the shaft or of any other pieces of equipment. A wheel machined as a unit will be perfectly round when the halves are reassembled and the irregular character of the break produced in forcing the two halves apart is a guarantee that they will occupy their proper relative positions when they finally are bolted together.

An interesting example of the manner in which the pulley making machine and equipment may be adapted to the production of other castings is illustrated in Fig. 8. In this instance a 24-inch diameter pipe connection, 32 inches in length flanged top and bottom and provided with a reinforcing flange around the center was molded on one of the pulley machines. The only new pattern equipment required for this job was a corebox for making the segmental flange cores. It will be noted that the top and bottom flange cores are alike. Cores for the center flange were made in the same corebox by dropping a stop-off piece of wood in the bottom of the deep flange.

The parting line was drawn as shown in Fig. 8 to avoid necessity of splitting the center flange cores and placing one half in the upper and one half in the lower half of the mold. In the method adopted the parting line was above the center flange plus the thickness of the upper part of the flange core.

In making the mold the ring pattern first was adjusted to a height of 18 inches above the face plate of the machine. The segment cores *A*, Fig. 8 were placed on the plate and pushed up close to the ring pattern. The drag flask then was placed in position, with the shallow bars across the top and with long vertical loose bars extending down almost to the face plate of the machine.

At the stage where the sand was rammed almost to the top of the pattern ring, the set of segment cores marked *B*, Fig. 8, was adjusted in place around the top of the ring pattern. The wider flange rested on the ring pattern and insured a straight and accurate flange. Sand was rammed around the cores and when the remainder of the flask was filled with sand and rammed in the usual manner. The pattern was drawn down through the face plate, after which the flask was lifted away turned over and placed upon a level sand bed.

The cope half of the mold was made in the same manner with two minor exceptions. No flange cores were placed at the joint line. The ring pattern was adjusted at 14 instead of 18 inches above the face plates. The cores *C* were similar to those at *B* and were incorporated in the mold in the same manner. Iron was poured into the mold through a single upright sprue extending from the top of the cope to the parting line. Two shallow branch gates at the parting line carried the metal from the sprue to the mold cavity.

The casting shown in Fig. 3 is typical of a line of castings required in the machine tool industry; castings required to meet critical inspection and severe specifications. Clean, smooth skin, straight lines, and generally pleasing appearance, practic-

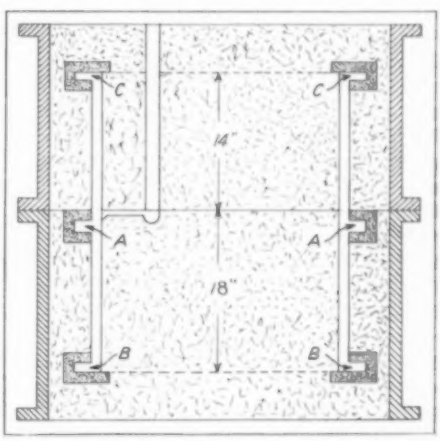


Fig. 8—Flanges are formed in dry sand cores rammed up in the mold

ally are as essential as strength, homogenity and accuracy of dimensions. A mold for one of these castings in process of construction is shown in Figs. 1, 2 and 7 and illustrates some of the methods adopted to secure perfect castings, while at the same time holding down pattern and molding expense.

In effect the plain octagonal box pattern was a huge core print designed to hold a great number of dry sand cores in proper relative position to form the mold. Sand rammed around the pattern in a strong cast iron flask formed the drag. This part of the mold was dried in the oven to form a rigid support for the lower cores, a support that would prevent them from straining outward under the pressure of the metal in the filled mold.

The mold with the bottom cores in place is shown in Fig. 1, while the succeeding stage with most of the side cores in place, is shown in Fig. 2. After the remainder of these cores and the center core shown in Fig. 7 were set, an empty flask was placed around them and the space between the cores and the flask was rammed full of green sand. A green sand cope was rammed on top of the assembled cores and was held in place by suitable weights.

These castings were poured from a special low carbon, low silicon metal derived from a mixture in the cupola containing 30 per cent steel scrap. In the dry sand mold the fins on the castings poured from this metal were chilled white, but the various parts of the casting machined readily and, where necessary, assumed a high polish.

A settled policy in the foundry where these castings were made, favors a highly refractory, highly permeable sand, hot metal, fast pouring, high heads and rigid molds. It is claimed that this policy practically has eliminated all loss due to porosity and shrinkage.

The same policy is responsible for the almost exclusive use of sharp sand in cores, large and small. These cores never cut, scab nor blow and for that reason are employed, even in places where a less permeable core might serve. The center core shown in Fig. 7 was not in this class. In the casting it was surrounded almost entirely by molten iron, intensified by the presence of eight deep brackets and for that reason a vast volume of gas was generated and had to escape rapidly.

This core was made and dried in halves and afterward the halves were bolted together. The parting line extends horizontally through the center as the core is shown in Fig. 7. The exposed tops of the loops in the two upper and the two lower petals—the core resembles a flower—were used in lifting the core into the mold. A quantity of coke in each section led toward the center and facilitated the escape of the vent through an opening in the top of the central hub.

Changes Adapt Patterns To Other Jobs

In connection with a program of standardization of operations within its plant, a German manufacturer of large engines, boilers, etc., has endeavored to save in the cost of manufacturing, stocking and maintenance of patterns ordinarily built for use in making only one casting, by adapting it to other castings. Information on the subject is presented in a recent publication of the American Standards association.

With a view to the importance of this matter, one man in the standards department is in special charge of the pattern department. A card file, carefully kept up-to-date, supplies the data required.

In many cases it is not possible to use existing patterns. However, instead of making a new pattern, it often is better to change an existing pattern to adapt it to the new case. The pattern then remains in this changed condition until a casting of the orignal pattern must be made again, or until a further change of the pattern is required.

As the file card records every casting of a pattern, together with its date, and as furthermore every change of the pattern—whether of a temporary or a permanent nature—is also carefully recorded thereon, it is possible to determine the condition of a pattern at any time.

In case, after a change in the pattern, a casting is no longer interchangeable with previous castings, special measures must be taken to prevent the manufacture of wrong castings. This could happen easily, for example, if a casting according to design *A* were ordered by one department, and approximately at the same time a casting *B* by another department. The most obvious remedy would then probaby be to give the casting made from pattern *B* a different pattern number. However, the change in the number of the pattern causes certain difficulties from the viewpoint of the pattern department, especially if such change is made rather frequently.

A simple solution of the problem consists in adding to the pattern number a special *part* number for each design, this part number to be separated clearly from the pattern number by a slant. This part number is repeated on supplementary parts belonging to a specific design, but it is not specifically mentioned on the main pattern. However, the part number must appear in the part lists and on the drawings, and it thus at once indicates clearly (1) that in the case under consideration one has to do with a pattern subject to changes, and (2) what pattern is desired.

In the same way as the checker of drawings, the checker of patterns also goes through the departments daily to see that consideration is given to existing patterns as early as possible in the designing stage. He furthermore supervises the changes and makes the necessary sketches to be transmitted to the file cards. This man, being a trained patternmaker, is in a position to give the designers information regarding pattern making and foundry practice.

Book Review

Acid Resisting Bronze (Sauerebestandige Bronzen), by Willi Claus and Hans Fincke, paper on cloth, 136 pages, 6¼ x 9¼ inches, published by Wilhelm Knapp, Halle (Salle), Germany, and supplied by THE FOUNDRY, Cleveland, and in London, England, by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

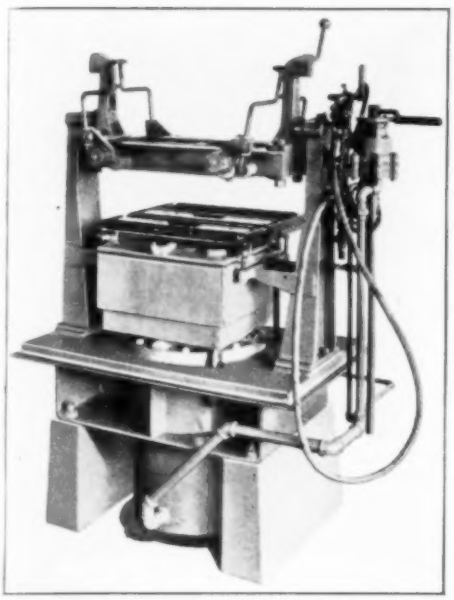
This volume, which is printed in German, is divided into four main sections relating to researches on copper, binary tin-copper alloys (tin bronzes), and tin; researches on red brass alloys, lead-tin bronzes, antimony-tin bronzes, and monel metal; systematic experimental technical testing of chemical corrosion, and bibliography. The first section has divisions on investigations of the effect of various corrosive agents such as ammonia, hydrochloric, sulphuric and phosphoric acids, alkalis, etc.; and evolution and application of the alloys. The second section is divided into two parts on manufacture and preparation of the specimens, and the various tests made. The third part discusses the difference between purely laboratory tests, and those conducted under operating conditions. The fourth section or bibliography contains over 700 references which are divided according to the topic covered.

Output Increases

Foundry output in the Worcester district stepped up slightly in October, according to the Foundry Council, Industrial Bureau, Worcester chamber of commerce. Output was 824,607 pounds against 733,107 pounds in September and 1,479,247 pounds in October, 1931.

Simplified practice recommendation R105-32, covering "Wheelbarrows" recently has been published by the department of commerce, bureau of standards and may be secured from the superintendent of documents, Washington, for 5 cents.

TABOR MOLDING MACHINES



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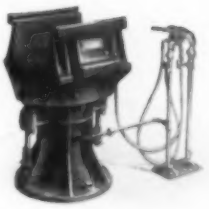
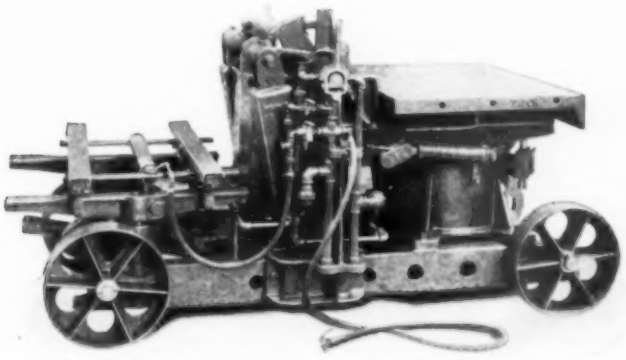


Jarring Flask Lift Machine
(Plain or Shockless Jar)

Power Squeezing
Split Pattern Machine

Shockless Jarring-Squeezing
Flask Lift Machine



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Redesigns Electric Melting Furnace

(*Concluded from page* 19)

tween 7000 to 9000 pounds both are in the field in the particular weight of castings made by the West Steel Casting Co. Above a daily melt of 9000 pounds the larger furnace is better and more economical.

The redesigned furnace has been designated in the accompanying table as Furnace No. 1. Furnace No. 2 still is operating under normal conditions as was No. 1 previous to the changes. The accompanying table was taken from the *Daily Cost Sheet*, which contains minute details, such as iron ore, manganese, silicon, new scrap, shop scrap, electrodes, etc. Space does not permit showing all of these details, but the entire group is entered into the column listed as *Material Cost*. The item labeled *Number of Men* represents the actual number of men working on or about the furnace. The cost of labor on the steel analyses and test work is included in the item *Labor Cost*. The item *Supervision* does not represent an actual cost, but a figure taken for comparison and remains constant. It is supposed to include the melter's salary and part of the office and administration expense.

Pays on Peak Demand

The furnace demand and the shop demand, as shown, are exact numerical readings from the meters. This demand number is to be multiplied by 48 and a correction made for power factor to give the kilowatt billing demand. The peak load that the foundry has during the week (not including the furnace load) is subtracted from the total demand to give the furnace demand. This practice, which on the surface appears unfair, is justified in that the melter is responsible for the furnace and shop demand and must balance the two at the lowest possible point. As the company pays on peak demand, it seems only fair that both shop and furnace should work their costs in peak demand basis. The daily foundry demand can be obtained easily by subtracting the power used during one demand hour by the furnace meter from the total demand set up for the week. The highest subtraction for the week represents the shop demand.

Physical and chemical properties of one of the regular heats in the small furnace are as follows.

Ultimate strength, 63,000 lb. per sq. in.	
Elastic limit	36,900 lb. per sq. in.
Elongation in 2 inch	31.5 per cent
Reduction of area	50.6 per cent
Carbon	0.17 per cent
Manganese	0.47 per cent
Phosphorous	0.026 per cent
Sulphur	0.045 per cent
Silicon	0.39 per cent
Chromium	Nil
Nickel	Nil
Molybdenum	Nil
Vanadium	Nil

The bend test showed 180 degrees without fracture.

An example of a heat of medium carbon steel where slightly higher elastic limit and ultimate strength are needed, is as follows:

Carbon	0.26 per cent
Manganese	0.75 per cent
Phosphorus	0.020 per cent
Sulphur	0.040 per cent
Silicon	0.34 per cent
Chromium	Nil
Nickel	Nil
Molybdenum	Nil
Vanadium	Nil
Ultimate strength	75,070 pounds per square inch
Elastic limit	48,410 pounds per square inch.
Elongation in 2 inches	24.5 per cent
Reduction of area	43.7 per cent
Brinell hardness	143

This material is used for such castings as gears and miscellaneous machinery where machining time is a large factor.

A sample of the S. A. E. alloy steel made by the West company is given in the following tabulation, both in the annealed state and also in the heat treated condition:

Annealed

Carbon	0.44 per cent
Manganese	0.56 per cent
Phosphorus	0.029 per cent
Sulphur	0.050 per cent
Silicon	0.55 per cent
Chromium	0.54 per cent
Nickel	1.21 per cent
Molybdenum	Nil
Vanadium	Nil
Ultimate strength	99,600 pounds per square inch
Elastic limit	77,330 pounds per square inch
Elongation in 2 inches	20.0 per cent
Reduction of area	39.6 per cent
Brinell hardness	187

Heat Treated

Carbon	0.44 per cent
Manganese	[illegible]
Phosphorus	0.029 per cent
Sulphur	0.050 per cent
Silicon	0.55 per cent
Chromium	0.54 per cent
Nickel	1.21 per cent
Molybdenum	Nil
Vanadium	Nil
Ultimate strength	121,000 pounds per square inch
Elastic limit	96,100 pounds per square inch.
Elongation in 2 inches	17.0 per cent
Reduction of area	31.8 per cent
Brinell hardness	269

Of course the brinell hardness under the heat treated condition can vary from 228 to 302, depending on the shock that the castings must withstand.

The furnace as redesigned has proved invaluable to the company for miscellaneous heats during the present dull time. It has been in operation since early in the spring of 1932 and the company is finding greater use for it daily.

Book Review

Foundrywork and Metallurgy, Vol. V, edited by R. T. Rolfe, imitation leather, 221 pages 5 x 7 inches, published by Isaac Pitman & Sons Ltd., and supplied by THE FOUNDRY, Cleveland, for $1.75 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., Caxton house, Westminster, London.

The fifth section of this series devoted to various factors pertaining to the foundry industry, deals with four specialized branches of castings manufacture. While space naturally limits the extent of the discussion, considerable valuable information on steel foundry practice, malleable castings, aluminum alloy castings and die castings is presented in this volume.

Steel foundry practice is discussed by James Cunningham and deals with the various types of melting units utilized by that branch of the industry. Attention also is given to the subject of steel molding practice, with emphasis on sands, cores, gates, shrinkage, heads, chills, and venting.

The section on malleable castings was prepared by C. Hubert Plant, and is devoted to a discussion of both the white heart malleable cast iron, which is manufactured extensively in European countries, and the black heart malleable cast iron, which is the basis of American practice. Information on each process includes mixtures, melting theory and practice, the annealing practice and tests and specifications.

N. F. Budgen, superintendent, Wm. Mills Aluminum Foundries, Birmingham, is the author of the section on aluminum alloy castings. The discussion pertains to various aluminum casting alloys generally used without heat treatment, the heat treatment of aluminum alloys, and castings alloys which generally are heat treated. The section on die castings by A. H. Mundey presents mixtures, the properties of mixtures and machines for die casting.

To Make Furnaces

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J. recently licensed the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to make high frequency or coreless induction furnaces or heaters for certain applications in the field of heating. The Ajax Electrothermic Corp. has received a license from the Westinghouse Electric & Mfg. Co. to use certain patents of the latter company.

Discusses Gates

Henry Biegel, general superintendent foundry No. 1, Allis Chalmers Mfg. Co., Milwaukee, addressed the regular meeting of the Wisconsin Gray Iron Foundry Group at the Hotel Schroder, Milwaukee, on Nov. 16. Mr. Biegel spoke on "Gates and Risers."

Deoxidizers for Brass Alloys

(*Concluded from page* 21)

The author's experience has not revealed this condition to any marked degree, but it may be that the percentage of leakers will be increased A trouble which is apparent has been described by one founder as wrinkle-like formations scattered over the castings, mostly on the outer surface, but some times on the cored surface. This defect is more pronounced on castings of varied section than on those of practically uniform cross section. These wrinkle-like formations are caused by phosphorus.

When removing heavily phosphorized yellow metal from the furnace a miniature snow storm of flakes of zinc oxide results. While that rages it would be impossible to make castings for the phosphorus coagulates the zinc oxide smoke which settles in fleecy masses within the mold. These fleecy masses are responsible for the wrinkle-like formations.

Too much phosphorus in zinc alloys causes the smoke to freeze and therefore the phosphorus must be cut down. If the flakes still indicate that too much phosphorus copper is being used, several things may be tried. The easiest method is to change from phosphor-copper to phosphor-tin, which contains 5 per cent or less of phosphorus. Add the tin in the same manner as the phosphor copper. The phosphor-copper also may be diluted so that it contains 5 per cent of phosphorus instead of 15 per cent.

Influence of Cutting

A study has been made by the bureau of standards of the influence of lathe-cutting conditions on the properties and structures of the machine surfaces of carbon and alloy steels to determine whether quality is being sacrificed for speed, as shown by the magnitude and depth of the work hardening of the metal at the machine surface.

Research Problems of Industry Are Listed

The bureau of mines, in co-operation with the committee on correlation of research of the American Institute of Mining and Metallurgical Engineers, has compiled a list of research problems engaging the attention of those industries dealing with minerals or mineral products, which has been published as information circular 6637, by A. C. Fieldner and Alden H. Emery. For convenience of reference the problems have been listed in divisions as follows: Coal; petroleum, natural gas and asphalt; nonmetallic minerals and products (other than coal, petroleum, natural gas and asphalt); metallic ores and products, and general.

Cast Iron Bridge Carries Heavy Traffic

In 1836, a bridge was constructed over Dunlap's creek in Harrisburg, Pa., using cast iron tubes, flanged and bolted together to compose the arch, according to a recent article in the *U. S. Piper*, published by the United States Pipe & Foundry Co. Since the bridge is located on a main turnpike, the traffic always has been heavy. In days gone by, this traffic was composed of wagons and stagecoaches. Today the pike is equally crowded with motor buses, automobiles and trucks. In fact, the traffic has been so heavy that it has been necessary to reinforce the bridge with cross-members shown in the accompanying illustrations.

The original cast iron tubes still are in service after nearly one hundred years of heavy usage, and the bridge probably will continue to be serviceable for years to come. The bridge was built by the engineers of the U. S. army and the use of cast iron indicates the reputation for durability which that material possesses.

Manual Gives Data on Refractories

A refractories manual, presenting standard specifications, methods of test and definitions of refractories, has been issued by the American Society for Testing Materials. The booklet also includes the latest revision of the manual for interpretation of refractory test data. Standard specifications include those for fire brick for malleable furnaces. Methods of testing are given for refractory brick, refractory materials under load at high temperature, chemical analysis of refractory materials, etc. Standard definitions include refractories, terms relating to refractories and heat transmission of refractories. The manual, comprising 93 pages, may be obtained for 50 cents from the association at 1315 Spruce street, Philadelphia.

New or improved methods have been developed by the bureau of standards for the determination of tin in ferrous materials, cobalt in iron and steel, silicon in ferrous materials, and molybdenum in ores and metallurgical materials. During the fiscal year ended June 30, 1932, 17 new specifications were published by the bureau, making a total of 121 which are recognized.

The cast iron bridge which spans Dunlap's creek at Harrisburg, Pa. The construction of the bridge is shown at the right—Illustration courtesy U. S. Piper

Loam Mold for Large Steel Casting

(*Concluded from Page 23*)

2-inch nozzle. The third ladle which was held until the last, contained 3 tons and the metal flowed through one 1½-inch nozzle.

With everything in readiness the two large ladles were spotted over the mold by two cranes, No. 1 over the runners *D* and *K*, and No. 2 over runner *E*. Nozzles over *D* and *E* were opened simultaneously and the metal was allowed to run until the smaller ladle was almost empty. The stream then was shut off in the 10-ton ladle over runner *E* and the nozzle also was closed in the 24-ton ladle over the runner *D*. At the same time the second nozzle was opened in the large ladle and the metal flowed first into the basin *K* and then down the central runner *M* and thence to the gates at the top of the casting. Runner basin *D* supplied the spaces *F* and *G*. Metal from runner basin *E* flowed down into the mold though spaces *H* and *J*, Fig. 10.

Ladles Are Shifted

When the metal in the mold appeared in the bottom of the four large risers, the stream from the ladle was shut off until the ladle had been shifted to a position where the stream could be poured directly into the heads. Later the 3-ton ladle was brought over the heads to introduce fresh, hot metal into the sinkheads.

After allowing a reasonable time for the casting to solidify, all the top impedimenta, runner boxes, weights, beams, etc., was removed and the binder bolts were released. The cope was taken apart and removed and the central head box was removed in the same manner. Sand was dug out from among the risers and from between the drawback sections. The sinkheads were cut off with an oxy-acetylene torch while the casting still was hot and in the pit.

Later the casting was lifted from the pit and taken to the fettling shop where it was cleaned and inspected preparatory to the usual heat treatment. In checking over the dimensions, a variation of ¼-inch was found in the diameters of the large flange. All other dimensions were as anticipated. The finished casting is shown in Fig. 9.

Preliminary operations for molding the distance piece shown in Fig. 11, were similar to those employed on the dome casting, with the exception that a ramming block was used to form the outside shape of the mold as shown at *A* Fig. 15. This shape afterward was trued up by the sweep or strike *B* shown in the same illustration. The inside of the mold was formed by a number of segment cores in which the runners were inserted. The corebox (with one end removed) and the style of arbor employed for making these cores, are shown in Fig. 12.

The top of the mold was covered with a number of segment cores containing openings for the risers as shown in Fig. 14. The corebox for making these covering cores with the riser block and the arbor in position, is shown in Fig. 13.

After the mold and core were dried they were assembled without any trouble. A number of large circular flasks were built up in the center and sand was rammed in the space between the cores and the flasks. In a similar manner, sand was rammed on the outside in the space between the outer wall and a ring of curbing. The assembled mold ready for the weights and runner boxes is shown in Fig. 16. The mold with weights, runners and risers in place is shown in Fig. 17.

The metal was pored from two ladles into two pouring basins and distributed to four upright sprues in practically the same manner pursued in pouring the metal into the dome mold. In like manner, pouring from both ladles ceased when the metal showed in the bottom of the risers. Then one ladle was removed and the second ladle was moved around to pour the remainder of the metal into the heads.

After the metal solidified the weights, head boxes and beams were removed from the top of the mold and the empty circular flasks were removed from the center. Parts of four of the large inside cores were dug away to facilitate contraction of the casting. This casting also came out to the anticipated dimensions.

Book Review

Industrial Management in This Machine Age, by Francis A. Westbrook, cloth, 407 pages, 6 x 9 inches, published by Thomas Y. Crowell Co., and supplied by THE FOUNDRY for $3.50 plus 15 cents postage and in Europe by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster, London.

The complexities of this industrial age constantly confront management and a definite knowledge of the various ramifications is necessary to co-ordinate all factors successfully. After outlining the principles and scope of scientific management, as developed by Frederick Winslow Taylor, the author discusses in some detail the separate and distinct duties which fall to the different departments of industrial establishments, and which include the establishment of standards for each of the duties, the co-ordination of the various functions to produce a balanced and efficient working force, and the successful guidance of the organization in attaining the realization for which it was established, namely the production of a demand service or commodity at a profit.

Included in the subject matter discussed are the following topical divisions: Scientific research and technical control; planning for growth; research applied to sales; organization of the sales department; organization and functions of the engineering department; organization of the purchasing department, production control; layout of plant for production; plant maintenance; inspection; costs; mechanical handling, etc. The work is prepared in an interesting manner and is based upon information collected by the author through interviews or correspondence with scores of executives of important companies. Numerous charts add to the value of the text.

Order Will Increase Rates on Sand

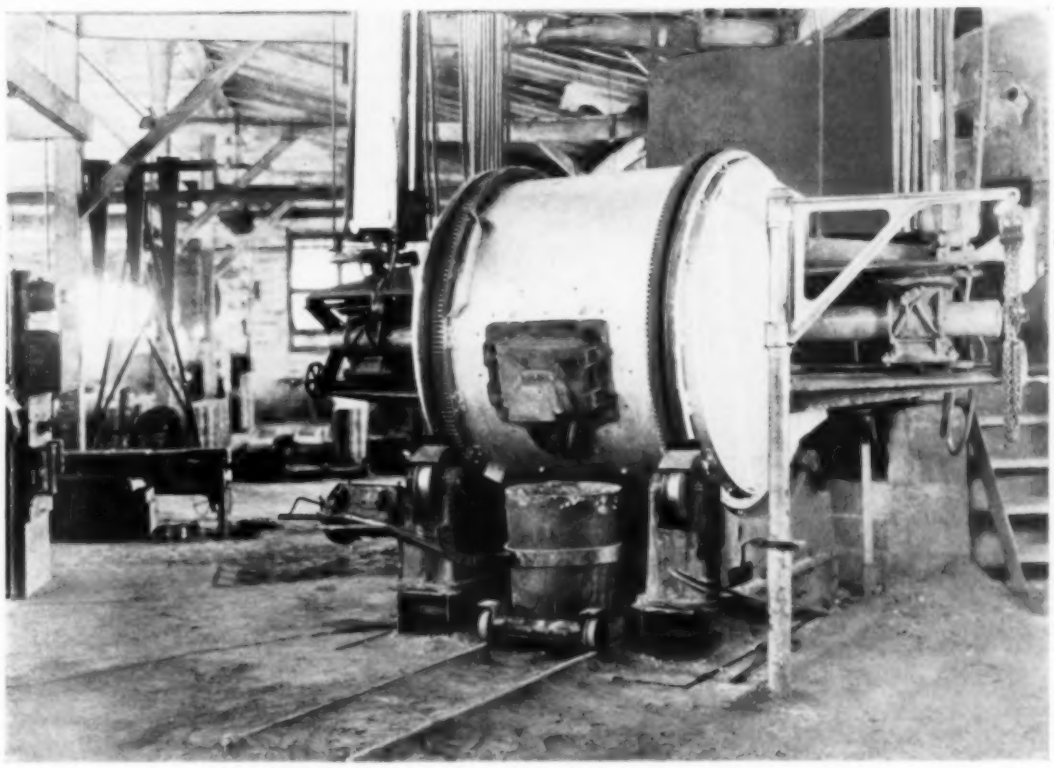
Some foundry sand users are faced with substantial increases in freight rates if a recent interstate commerce commission order becomes effective Feb. 1, 1933, as now scheduled. Conferences of sand consumers are being held for the purpose of formulating plans to obtain a rehearing on the case and of reopening or modifying the order entered by the commission.

The decision, which affects all territory east of the Mississippi river and north of the Ohio and Potomac rivers, is included in Docket No. 22907 and related cases generally referred to as the "Industrial Sand Cases 1930." The final report was released about three years after proceedings were originally instituted in 1929. In effect it terminates a practice generally in vogue since the beginning of the railroad era and makes freight rates on sand contingent upon several classifications. Separate rates ordered to apply upon sand used in building, paving or ballasting operations and upon sand otherwise used in the industrial arts.

Three classifications have been drawn. The first includes high silica sand, molding and core sand and other sand from certain points in Indiana, Michigan, Ohio and Pennsylvania, all carried in open top cars. The second classification covers all kinds of sand moved in box cars, except ground and pulverized sand, while the third includes ground or pulverized sand, silica, clay, flint and tripoli in carloads. The new rates in many instances double the cost of moving foundry sand compared with the old schedule.

Foundries who for certain reasons take their sand requirements in box cars for convenience in unloading will pay a higher rate than if the sand were delivered in open top cars.

A Metal Melting Machine



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ASK THE MAN WHO USES ONE!

Detroit Electric Furnace Co.

829 W. Elizabeth St., Detroit, Mich.

Handle Material on Conveyors

(*Concluded from page* 14)

castings made on these conveyors.

Due to the extremely rigid inspection to which the castings are subjected—physical and chemical properties in some, and surface appearance in all—the sand supply must be prepared and delivered in a condition approaching absolute uniformity. Fortunately the sand is not subjected for prolonged periods to high temperatures from large bodies of molten iron. The bond is not broken down to any appreciable extent and the volume of fines developed is not sufficient to affect the sand adversely.

A small quantity of new sand added at periodical intervals to the old sand as it falls through the shakeout gratings, compensates for the loss of sand carried away with the castings and also serves to maintain bond and permeability. Amount of new sand added daily varies according to the percentage of capacity at which the conveyors are operating.

Commencing at the shakeout stations—raised steel hoppers with gratings flush with the tops of the conveyors—sand falls into a long trough below the floor. A reciprocating flight conveyor moves the sand from right and left to a point in the center where it falls on to a wide inclined belt which may be noted in the center of the illustration Fig. 1.

Collects the Scrap

The belt discharges the sand into a screen which removes scrap and foreign inclusions. A chute under the screen conducts the scrap into a dump bucket resting on the foundry floor. The bucket is suspended from the monorail at periodical intervals and carried back to the cupolas.

From the screen sand is fed into a form of pug mill, or mixing unit where a set of short blades or paddles on a revolving shaft promote a homogenous mixture and at the same time help to cool and aerate the sand. The pug mill discharges the sand into a chute leading to the boot of a bucket elevator. This part of the system is shown in Fig. 5 where it will be seen that all the driving apparatus is enclosed in dust proof casing.

In the next step of the process the bucket elevator discharges at the top on to a belt which in turn delivers the sand into the open upper end of a storage hopper with a capacity of 150 tons of sand.

Here the sand has the time and opportunity to cool and become normal. The hopper or tank is supported on a suitable steel frame work independently of the base. This base is caused to revolve horizontally by a small motor and as it revolves, a plow deflects the descending sand so that it falls on to a long inclined belt shown in Fig. 3. Water from a perforated pipe is added to the sand at the beginning of that journey.

The belt discharges the sand into a disintegrating device where it is flung violently against a staggered collection of suspended rods which break it up into a smooth, homogenous mixture fit for molding purposes. The disintegrating device is hinged at one end and mounted on an eccentric device at the other end. The action of the eccentric causes the device to rise and then fall sharply, thus shaking the clinging sand from the rods and walls. The prepared sand falls on the belt shown extending up from left to right in Fig. 3 and is carried up to the three flight conveyors for distribution to the three molding stations.

Due to the greater amount of sand required by the two batteries of molding machines serving the large conveyor, the hoppers over each battery of machines are served by an individual flight conveyor. Horizontal plows set immediately above the main feed belt, deflect a certain amount of sand into the first flight conveyor. A second pair of plows deflect part of the remaining stream into the second flight conveyor. The residue travels close to the end of the line and is plowed off into the third flight conveyor. By suitable adjustment of the plows, the volume of sand entering any of the conveyors may be regulated.

Bulletin Covers Heat Treatment of Iron

"Physical Properties of Heat Treated Cast Iron" is the subject of a report by F. G. Sefing and M. F. Surls in Engineering Experiment Station bulletin No. 47 which is published by the Michigan State College of Agriculture and Applied Science, East Lansing, Mich. Data presented lead the authors to conclude that as the annealing temperatures rise from 800 degrees Fahr., the transverse strength, tensile strength and brinell hardness decrease while the impact values increase slightly until the critical point is reached at about 1500 degrees Fahr. The deflection remains about the same.

It was found that the effect of quenching from below the critical temperature is nearly the same as the effect of annealing from the same temperatures. From 1400 degrees Fahr. to 1600 degrees Fahr., the effect of quenching both types of iron is markedly to increase the tensile strength and the brinell hardness while the deflection and transverse strength decrease considerably.

In the case of samples quenched from above the critical point and tempered at 900 degrees Fahr., an increase in transverse strength, deflection, and a decrease in brinell hardness was noted. Higher drawing temperatures reduce transverse strength, tensile strength, deflection and brinell hardness and in most cases increase the impact values.

Speaks on Alloys At Quad City Meeting

E. K. Smith, Electro Metallurgical Sales Corp., Chicago, presented an interesting paper on "Applications of Alloys in Cast Iron" before the regular meeting of the Quad-City Foundrymen's association held at the LeClaire hotel, Moline, Ill., Nov. 21. Among the points stressed by the speaker was the fact that while the foundryman cannot make bad iron good by adding alloys, he can make good iron better.

M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill., showed several reels of talking movies illustrating the Caterpillar tractor and the diesel engine which is manufactured by that company.

A. D. Matheson, chairman of the membership committee, appointed the following to serve on that committee: Hugo Wolff, Frank Foundries Corp., Davenport, Ia., Clyde H. Burgston, Deere & Co., Moline, Ill., F. O. Gorman, John Deere Spreader Works, East Moline, Ill., C. Kropp, The Bettendorf Co., Bettendorf, Ia., and Roy Schofer, Rock Island, Ill. About 80 members were present at the meeting which was presided over by Charles F. Scherer, Davenport Machine & Foundry Co., president of the association.

The next meeting will be held at the Fort Armstrong Hotel, Rock Island, Ill., on Dec. 19.

Made Sales Manager

George M. Sharer has been made sales manager of the eastern division of the Link-Belt Co., with headquarters at Philadelphia. Mr. Sharer has been connected with the Link-Belt Co. in various capacities for the past 32 years.

Carl Levahn, in charge of the machine shop, International Molding Machine Co., Chicago, since 1910, recently returned from a three month's trip to his native country, Sweden.

Consider Taxation and Legislation

(*Continued from Page* 17)

ernment's emergency step into the field of private banking. This has placed the government in position to exert influence not only on business but society, with a great opportunity for harm. Even after the individual loans have terminated, the effect might continue indefinitely, he declared.

Severity of the times, which has disrupted many organizations, has made it all the more imperative for foundrymen to keep up the personnel and educational work of the association, according to A. D. Lynch, director of personnel, Ohio Brass Co., Mansfield, O., who outlined work accomplished over the past year. He said that the foundry industry in general has felt the results of the past three years more heavily than most others, and that attention to training and the best technique in leadership is essential.

Lionel D. Edie, vice president, Capital Research association outlined business prospects in the light of recent developments. The deflation in commodity prices was arrested in the early spring. This was due in large measure to the policy of the Federal Reserve board. Since that time there has been a horizontal movement, rather than a 45 degree angle of decline in the curve. Easy money through excess of bank reserves provides a powerful force toward recovery, but one which precedent has shown may not be effective for a varying period. The result is a period of stagnation, which the Fall seasonal advance has not served to carry over. American banks now have 36 per cent invested in government securities against about 12 per cent prevailing in British banks. This huge pool of inoperative capital will be more readily available and active in industry, if certain remedial measures are adopted.

Must Balance Budget

The unbalanced budget shakes confidence. With that uncertainty removed, we stand on the threshold of recovery. The answer must be found. Conservatives must exert continued pressure to bring about a balanced budget, at the so-called lame duck session if possible. Governmental expenses must be reduced and the era of constantly increasing use of public funds through Federal aid must be brought to an end. Otherwise no hope is in sight before spring.

An interesting study of the depression effects on employment was given by F. Spencer Baldwin, director of research, National Industrial Conference board, Inc. He gave comparative statistics showing that the mounting unemployment total has been checked. Some of this is due to spreading of work and represents a palliative rather than a cure. A review of the failure of state unemployment plans in Europe was given. In Germany the system was wrecked by the demands of widespread and continued unemployment. Starting with assessments of 3 per cent split between employers and employes in 1927, the percentage was raised to 3½, 4½ and finally 6½ per cent of wages paid and the compensation cut steadily from a maximum of $5.25 a week for a single unemployed worker to $2.39 a week. The poor relief paid these persons exceeded the insurance, but neither provided adequate sustenance.

Mr. Baldwin outlined his personal views on an insurance system and recommended that employers anticipate this burden by taking the initiative.

Different Premises Necessary

John Lovett, manager, Michigan Manufacturers' association, Detroit, took issue with this conception. He pointed out that in making a comparison beween workmens' compensation legislation and the recommended unemployment insurance, two radically different premises were necessary. The workmens' compensation was voluntarily advanced by employers as a protection against excessive personal damage suit awards. It resulted in lowered accident rates. Further it was within the control of employers to regulate and constituted a measurable hazard. Unemployment, on the other hand is not measureable by any actuarial system. It is not within the control of employers to reduce or abate. Unemployment insurance is a long step in socialization of all industry and any employer-employe system or similar palliative is not recommended.

Consideration of dust hazard in industry formed the theme of the session of the National Founders association convention in New York, Thursday. Dr. Carey P. McCord, medical director, the Industrial Health Conservency Laboratories, Cincinnati, gave a complete and thorough discussion of silicosis covering the factors of characteristics, control and compensation.

Dr. McCord, using slides prepared from X-ray examinations, demonstrated the effect of silica dust upon the lungs when inhaled in quantities and over a long period of time. The factors which govern are the percentage of dust, the length of exposure, the size and number of particles and the susceptibility of the person exposed to these hazards. In the majority of instances the disease is incurred after exposure of 5 to 10 years and reasonable safety may be assumed in periods of 2 to 3 years, but for safety it is recommended that workmen do not be exposed to severe conditions for more than 1 year. No recognized limit of dust concentration has been established. However the minute particles are the dangerous element and it is assumed that the harmful particles fall in the range of ten microns or less. There is no known treatment or cure for silicosis.

It is recommended that prevention is not only practical but advisable and neglect probably is the reason for exceptional exposure.

In Variety of Industries

In recent years silicosis has come to be the most costly of occupational diseases and is encountered in a variety of industries. In the foundry industry it is suggested that workmen be given rotating service, that is under the present state of protective facilities. No persons below 30 years of age should be employed upon exceptionally dusty operations.

In covering the question of control, Dr. McCord stated that three departments of the foundry seem to be the chief dust producers. These are the cleaning, shakeout and sand conditioning departments. Inasmuch as recent controversies have centered about the casting-cleaning operation, more attention was devoted to that phase in his suggestion for control measures.

Careful physical examinations are imperative. Such examination should include an X-ray of the chest and no persons having evidence of respiratory tract disease should be accepted for the more hazardous classes of employment. Rotating services, limiting exposure to the dusty conditions to one year, are recommended. The isolation of the departments from which silica dust is emanating is recommended, with careful safeguarding of all equipment. The introduction throughout the foundry of good housekeeping methods, removal and prevention of accumulations of settled dust characterize a major safeguard recommended by Dr. McCord. The use of dust-proof machinery in casting-cleaning with stringent attention to maintenance and inspection for efficiency are suggested. The installations of highly effective local exhausts at all points where dust originates are advised. The use of positive pressure and filter types of masks and helmets, carefully constructed, supervised and regularly inspected, is suggested for all work in situations where dust concentration is encountered. Avoidance of fatigue-producing practices including extended overtime is advised inasmuch as the increasing rate of respiration and deeper breathing encountered with ex-

haustion is conducive to harmful effects.

In covering the question of compensation, reference was made to recent decisions in which absence of neglect constitutes a defense. The settlement of individual cases by compromise or the acquirement of insurance is likely to be advisable particularly when small plants are confronted by suits claiming death or permanent impairment by silicosis.

Many are of the opinion that a modification or introduction of new laws to place all dusty lung diseases along with other occupational diseases under occupational insurance is advisable.

In the discussion it was developed that while it is possible to determine the percentage of free silica present in dust, no positive method has been found for determining dust count nor has a standard of safe minimum been established.

E. O. Jones, Belle City Malleable Co., reviewed the situation in Wisconsin. Representatives of the foundry industry in cooperation with the industrial commission have conducted research which has shown that a large amount of the dust now encountered in foundry operations can with proper precautions be abated. With 21 foundries co-operating on an investigation, careful survey was made of operating conditions and this was accompanied by chest examination of workmen. Reports made available to the foundries have been responsible for improvement in conditions. A clinic has been established and a regular procedure providing for periodical physical examination has been adopted. In co-operation with the Employers' Mutual Liability Co. of Wisconsin an X-ray laboratory has been established for common use of those in the co-operative enterprise.

Dr. William J. McConnell, Metropolitan Life Insurance Co., New York, stated that it is inadvisable and impractical to set up a standard of dust count as a measure of safety. The dust count, however, is effective and valuable as a measure of efficiency of dust prevention systems. The average physician is not qualified to diagnose silicosis. In fact, many experienced and able X-ray doctors are not trained to know this disease. Therefore, the need for expert opinion in cases of controversy is evident.

Adopt Resolutions

The resolutions committee reporting at the closing session, presented a strong demand for reorganization, reduction, systemization and centralization in all governmental activities leading to some relief from the burden of disease now imposed upon industry. This resolution which was presented by Frank M. Weymouth, Hunt-Spiller Mfg. Corp., Boston, was unanimously adopted. S. Wells Utley, Detroit Steel Casting Co., Detroit, was re-elected president for a third term. Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md., was elected vice president, A. E. McClintock, Chicago, again was chosen as commissioner and J. M. Taylor, secretary and treasurer.

Safe Driving Requires Constant Inspection of Trucks

A DISCUSSION of driver training, as has appeared in several recent issues of THE FOUNDRY, would not be complete without reference to the owner's responsibility of keeping trucks in safe operating condition. It would be inconsistent and unjust to drivers for the management to attempt to operate a driver-control system, involving penalties for accidents, if the drivers were required or even permitted to take out trucks not systematically inspected and maintained.

Work Done at Plant

Usually certain specific operations should be done within the plant and others in an outside shop. Economy and convenience will determine the decision in regard to each. Factors to be considered are the number and kind of trucks; territory and particularly the distance covered from the garage; availability of outside service as good as or better than can be set up within, and the relative cost and satisfaction resulting from the alternative policies.

For the smallest fleet, provisions should be made for daily or at least reasonably frequent inspection of brakes, steering gear, tires, lights, horns and other signalling devices. Labor will be the principal expense, since the tools and testing equipment is small. For the more refined tests, such as, wheel alignment, brake adjustment, etc., outside service stations may be relied upon, unless the fleet is large enough that purchase of the equipment is an economy.

When inspection reveals the need of adjustments or repairs, unless they are such as can be made by a reasonably skilled mechanic with hand tools, the work should be done by a specialist, tooled for that work. This applied to such operations as relining brakes, truing brake drums, straightening axles and any others.

Self service in lubrication and the tightening of loose nuts and bolts, requiring no heavy investment in equipment, also will be in order for the smallest fleet. There may well be added facilities for numerous operations that may be classified as maintenance rather than repairs such as, adjusting carburetors; fuel feed, ignition and electrical systems; engine valves, and bearings of all kinds. Carbon removal and engine tuning may be left to the fleet's own mechanic, but complete overhauls and major repairs are likely to cost less and be done better in the shops of outside specialists.

Too much cannot be said against the common and bad practice of inspecting trucks only after drivers have reported trouble.

Inspection should be made regularly. Brakes, steering gears and tires should be inspected daily no matter how little the car is run. Inspection of other parts for repairs that are not so necessary to safety as to continued and economical operation, are usually made at specified mileage intervals. In other words, the driving mechanism should be inspected according to the miles of use and the stopping and control mechanism on a time basis.

Next to regularity in inspection is thoroughness. Unfortunately the more regularly inspections are made the more perfunctory they are likely to become. The best way to insure thoroughness is to provide the inspector with a printed report form, itemizing the parts that must be examined, requiring him to check each item as he inspects it on that form. This procedure affords a record that may be valuable in subsequent investigations of accidents or mechanical failures to fix the responsibility.

When it is discovered that a driver failed to report a fault of which he must have been aware, he should be penalized sufficiently to cure the negligence, as by the loss of some credit toward a bonus or other reward, a fine or the loss of a day's vacation where one is given with pay. If such lapses become chronic, a driver should be dismissed.

Studies Removal Of Soot from Furnaces

Results of an investigation of methods of removing soot from chimneys are contained in a recent report of the U. S. department of commerce, bureau of mines, on "Removal of Soot from Furnaces and Flues by the Use of Salts or Compounds." The report was prepared by P. Nicholls, supervising engineer, fuels section, Pittsburgh Experiment station, bureau of mines, and C. W. Staples, assistant fuel engineer of the Pittsburgh Experiment station. The publication may be obtained from the superintendent of documents, Washington.

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The Adventures of Bill

BY PAT DWYER

BILL has a curious habit of rooting around in the ashes of dead fires—figuratively speaking—in search of some small forgotten ember which he then proceeds to blow into a flame. In many instances the process adds little to the sum total of human knowledge, but the occupation seems to afford him a certain amount of pleasure. Since he is content to furnish all or nearly all the energy required, I see no reason for interfering. Occasionally he raises a controversial point which may or may not call for a comment on my part. Usually I smoke in peace and just listen.

Bill can smoke and talk at the same time. He can even expectorate without removing the pipe stem from between his teeth—the *summa cum laude* of the expert smoker—but although I practiced diligently enough in my youth, I never acquired the necessary skill. As with playing a horn one must be blessed at birth with a natural endowment. What little proficiency I acquired many years ago was destroyed when the dentist finished driving various shafts and tunnels and erecting pit props here and there to prevent the workings from collapsing. Bill's teeth are not as large and formidable as those of a Missouri mule, but they are as solid as when they first sprouted from his iron jaws. He modestly admits that although they have seen considerable mileage, they probably will see him through to the end of the journey. After that he does not care who trades them in on a new set.

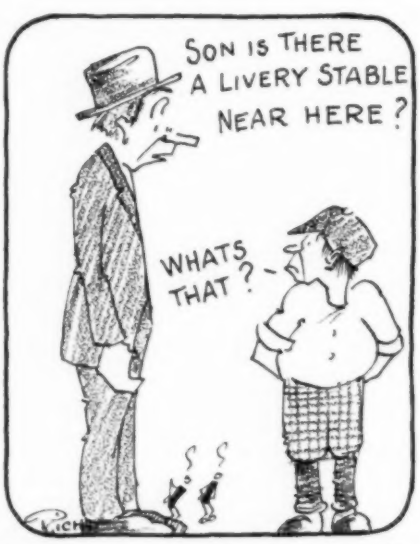
However, as I was saying, he has a curious habit of harking back to closed incidents. Of reopening them for further investigation. What is still more disconcerting, he calmly assumes that my train of thought has paralleled his, and is astonished when I ask him what he is talking about. I should be a mind reader.

"Do you know," he said the other night, "that old lad compressed a lot of knowledge in a small rhyme."

"Why don't you send him a congratulatory post card?" I suggested. "No doubt he will be greatly pleased. However, considering the fact that I don't know to whom or what you refer, you will pardon me if my pulse remains normal. Who was the lad and what did he say?"

"You are slipping my boy. Better have the old mental brake bands tightened. I never heard of the lad or what he said until you sprung him on me in the form of a quotation one night right here in this very identical room. Now you sit there like one of these here now gargoyles on a church steeple and brazenly disclaim all knowledge of the incident."

"I have seen gargoyles whom I would back any day in an intelligence contest with a certain person whose name I won't mention, but whose initials are B.I.L.L. I may have used my entire repertoire of seven—count 'em seven—quotations on the occasion to which you refer. How am I to know which of the seven appealed to your limited intelligence? What's the answer to that?"



Strangers could find a livery stable in the dark

"To refresh your memory," Bill kindly explained, "we were talking about women and horses and one thing or another. You quoted an old saying: 'Four things greater than all things are, women and horses and power and war.'

"I thought at the time that the author's poetical licence should be canceled for his crude attempt to throw into rhyme a truth that might be presented better in prose: 'Four things greater than all things are!' Why could not the poor gommoch have said, 'Four things, women and horses and power and war are greater than all others?' He could have cut it down still further without sacrifice of style or strength: 'Women, horses, power and war lead the field!' The most pitiful feature of all is that he had a word right to his hand to make the lines rhyme properly and did not have sense enough to use it."

"Oh yeah. What is the magic word?"

"Nothing magical about it. The simple old Irish word 'begor!' Listen:

The four greatest things in the world, begor!
Are women and horses and power and war.

"Well," I admitted, "you have improved the rhyme, but in all fairness I must direct your attention to the fact that the original saying is credited to the Arabians. Oriental languages are noted for their poetical flexibility and wealth of imagery. It is quite possible that in the original language the saying conformed accurately to the highest canons of poetic art. The Arabs, also, if we are to believe all we hear and read were more—shall we say enlightened?—were more enlightened than other people on the four items under consideration."

"Well," said Bill, "I'll tell you. It stands to reason that men who practice polygamy should know more about women than men whose experience is confined to the study of a single specimen. On the other three items, horses, power and war, I have my doubts. War, women and power are closely related and it is only natural to find them grouped.

"Horses are entitled to a classification by themselves and I don't think any nation has a monopoly in its admiration for and familarity with these noble animals.

"The automobile and the motor truck have pushed the horse from the cities and the great highways. The present generation regards him as something of a curiosity to be cataloged with the spinning wheel, hand power cranes and beer barrels.

"I have not seen a livery stable for years and I often have wondered what has become of the proprietors —usually abbreviated to Prop.— kindly, shrewd and humorous men who were regarded as oracles in their respective communities. Also I often have wondered what new roosting place has been found by lads accustomed for years to using the livery stable office for an open forum where horses—and practically every other subject under the sun —were discussed night and day.

"In summer the boys sat on the office steps and on straw bottom chairs tilted against the wall. The space in front was the natural earth beaten down hard, but still sufficiently permeable to absorb an incredible volume of tobacco juice sprayed at random. As each quid lost its potency and thus automatically became an *old soldier*, the chewer skilfully deposited it in his throwing hand and then hurled it through the near by stable door.

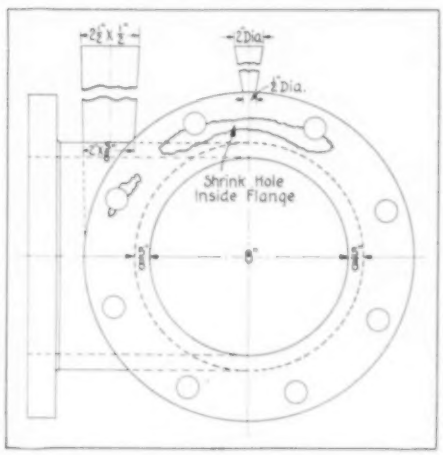
"In winter the faithful cronies held their sessions in the office where a round stove contributed to their comfort and where spirited lithographs of race horses, pugilists and illustrations from the *Police Gazette* pasted on the walls, furnished topics of conversation.

"These men held widely divergent views on art, politics, literature, the drama and religion. In some instances their knowledge of any particular topic was extremely limited. They were narrow minded, provincial, partizan and bigoted, highly desirable elements in acrimonious debate. On the subject of horses they were omnicient. They were veritable encyclopedias on the appearance and performance of every horse, public and private, in the country and could recite their pedigrees more accurately than they could trace their own.

"Horses in those days were not just so many animals. Each was an individual with characteristics as sharply defined as those of so many individual human beings. In her heyday, Maud S. was known to people who could not tell you off hand the name of the president of the United States.

"The old livery stable gang were experts on the construction, finish and operation of every form of vehicle on two wheels or on four. They knew the relative merits of every style of harness and could throw the complicated harness on a pair of horses and hitch them to a rig as readily in the dark as in broad daylight. They could tell to an ounce what weight a horse should carry in his shoes, on his back, or in his stomach. They viewed the average veterinary with amused toleration and almost without exception could recite personal experiences of miraculous cures effected after the veterinary had failed.

"God be with the good old days," Bill sighed, "when we were young and life flowed along like a song. In those days if I lost a casting I gen-



The shrinking cavity was not disclosed until the bolt holes were drilled

erously allowed the gaffer to worry over the cause and prescribe a remedy. If the second casting went the way of the first—back into the cupola—I decided that the old man's reputation for infallibility had been acquired under false pretense. In later years I learned to revise this opinion to a radical extent. So many variable factors are present in some instances that no man can place his finger unerringly on one and say, 'Here is the cause of the trouble.'

"A typical instance of this kind turned up recently in a letter and a sample casting submitted by a man who reported that an epidemic of shrinkage had appeared in his flanged pipe fittings in sizes ranging from 6 to 12 inches. The shrinkage cavity appeared in various sizes near the center of the flange on the cope side, but was not visible until the flange was faced and the bolt holes drilled. The molds and cores were made in green sand and the flasks were deep enough to provide a 6-inch head over the flanges. He had gated the castings on the top, on the bottom and at the joint, but the results were the same. A drawing which accompanied the letter showed an 8-inch tee poured through a vertical gate ⅜ x 2 inches attached tangentially to the upper side of one flange. A riser ½-inch in diameter at the point of contact and tapering to a diameter of 2 inches was taken off the opposite flange. The analysis of the iron had not changed for years. The fracture of the metal and the machining qualities were quite satisfactory. In one instance he had applied a chill to the back of the flange in the cope and the only effect was to drive the cavity into the drag.

"The peculiar set of conditions to which he referred seem to indicate that at least one of the factors incident to the production of castings had been changed to a considerable extent. The analysis and surface appearance of the sample submitted indicated that apparently the iron is not responsible for the trouble. The 6-inch pouring head eliminates the theory that the shrinkage is due to insufficient static pressure. The next two logical places to seek a solution are the sand and the method of molding

"A change of this kind would not cause any trouble over the body of the casting, but it might cause the iron to boil at the ring where the flange joins the body. The commotion might not be serious enough to show in the small riser, but it would be sufficient to cause a cavity in the flanges during the solidifying period.

"To test this theory I suggested he should vent the sand liberally on the inside of the flanges. Make a few molds carefully by hand. Use a sand mixture as open in texture and as dry as it can be worked. See that the vent can escape readily both from the drag and the cope. Pour the metal slowly and *touch it up* once or twice when the mold is nearly filled.

"If the casting made in the foregoing manner is defective, then an examination of the metal and the method of melting is in order. Long distance diagnosing involves a considerable amount of guessing since it does not include a complete knowledge of every factor involved.

"A possibility exists that the sand in the bottom yields after the mold is filled and as the walls of the casting expand the liquid metal in the top of the flange sinks.

"The gating method is open to question. The design of the casting in which the flanges are 1¼ inches thick while the thickness of the body is only ⅝-inch, militates against uniformity in solidifying. Naturally the flanges are the last to set and the flange supporting the gate will set last of the three. The small gate sets almost immediately and all the remainder of the casting draws metal from the flange in which the metal still is liquid. A wedge or finger gate on top of the body would equalize the temperature of the metal and insure approximately uniform shrinkage and contraction."

European Foundry Practice

Digest of recent literature covering various phases of castings manufacture

Automobile Castings

Use of Cast-Iron in the Automobile Industry, (L'Emploi de la Fonte dans l'Industrie Automobile) by Charles Schimpf. *La Fonte*, bulletin of the French center of cast-iron research, Paris, July, 1932.

From the standpoint of weight, cast-iron comes immediately after steel in range of metals and alloys used in automobile construction. Automobile castings must be devoid of physical defects, easy to machine, and show resistance to wear. Certain castings must be water and gas-tight. Avoidance of physical defects is a matter for molding and melting control. From the standpoint of machineability, brinell hardness should range between 240 and 215, and, above all, the iron should be devoid of hard spots.

Resistance to wear is of great importance, especially for cylinders, and particularly in view of the increase in the number of revolutions per minute of modern cars. The problem is complex, and only practical experience supplies the test as to the wearing qualities of an iron. Hardness is not a sure indication of resistance to wear. On the other hand, resistance to wear and machineability are generally in opposition; therefore, a compromise must be found. For cylinder blocks, perlitic iron is satisfactory. Valve seats generally are inserted. Great progress has been made with respect to piston rings.

Aluminum Bronze

Rational Use of Aluminum Bronze, by C. H. Meigh, *Foundry Trade Journal*, London, Oct. 20, 1932.

The designer's attention is directed in this article on aluminum bronze to the importance of two details in the cast correlated problem of solidification and internal stresses. Two phenomena play an all important part in this problem, namely, that the metal passes from liquid to solid without passing through an intermediate stage; and that there is an important internal contraction when the crystals solidify.

Three advantages are obtained from these conditions, namely, the danger of fracture at the junction of the thick and thin sections is eliminated by solidification without an intermediate phase; the thin sections have the effect of chilling fins and accelerate the solidification of the thick sections in their vicinity; and the internal stresses can be considered as negligible, as they are, to a great extent, eliminated by the annealing effect of the heavy sections which keep hot sufficiently long to provide partial if not total equilibrium. The author devotes most of the article to a discussion of solidification.

Rotary Melting Unit

The Sesci Melting Furnace, *Foundry Trade Journal*, London, Sept. 8, 1932.

National Gas Engine Co. Ltd., recently installed a five-ton furnace of the Sesci type in their foundry. Objective of the installation was the production of more uniform and higher grade castings through more perfect control of melting operations. Results already reported justify the enterprise.

This article describes the general layout of the furnaces, charging equipment and the fuel preparing equipment, and discusses the operation of the unit.

Loam Molding

Cylindrical Cores in Loam (Noyaux Cylindriques en Terre), by the Technical Committee of the Belgian foundry association. Second installment. Rapporteur: M. Vandendries. *La Fonderie Belge*, Liege, June and July, 1932.

Loam cylindrical cores can be made by hand or in special frames or core molds, or with a strickle board, on a barrel or vertically. The first installment of the report describes methods of making cylindrical cores in loam by hand, and partly by hand and by special frames or core boxes.

In the hand process a blank is first prepared. Either the blanks are for cores of known dimensions, or the blanks are made in advance for cores of unknown dimensions. Cores are finished by scraping the blanks to correct dimensions with a hand rasp.

Other methods are described, in which the cores are made partly by a cylindrical mold which molds the upper half of the core, or about three-quarters round the circumference; the cores then are finished by means of a hand rasp.

The second instalment describes a method for making cylindrical cores in two halves, which are joined. For cores up to 4 inches in diameter, small iron rods are used for reinforcing. Air is drawn through a slot made along the axis of the core. When the diameter ranges from 4 to 8 inches, with a length under 500 millimeters, the reinforcing bars are in cast-iron, and straw is wound round the bars for the passage of the air.

For cores over 8 inches in diameter, the reinforcing is effected by a grill of special shape. The center of the core is filled with coke or slag to afford an outlet for gases, and straw is then wound round the bars of the grill for the air passage. As the cores become larger, the reinforcing becomes more heavy and complicated, and an example is given of a core of nearly six feet in diameter. For very resistant and large cores, a combination of cast-iron grills and ordinary bricks can be used for reinforcing.

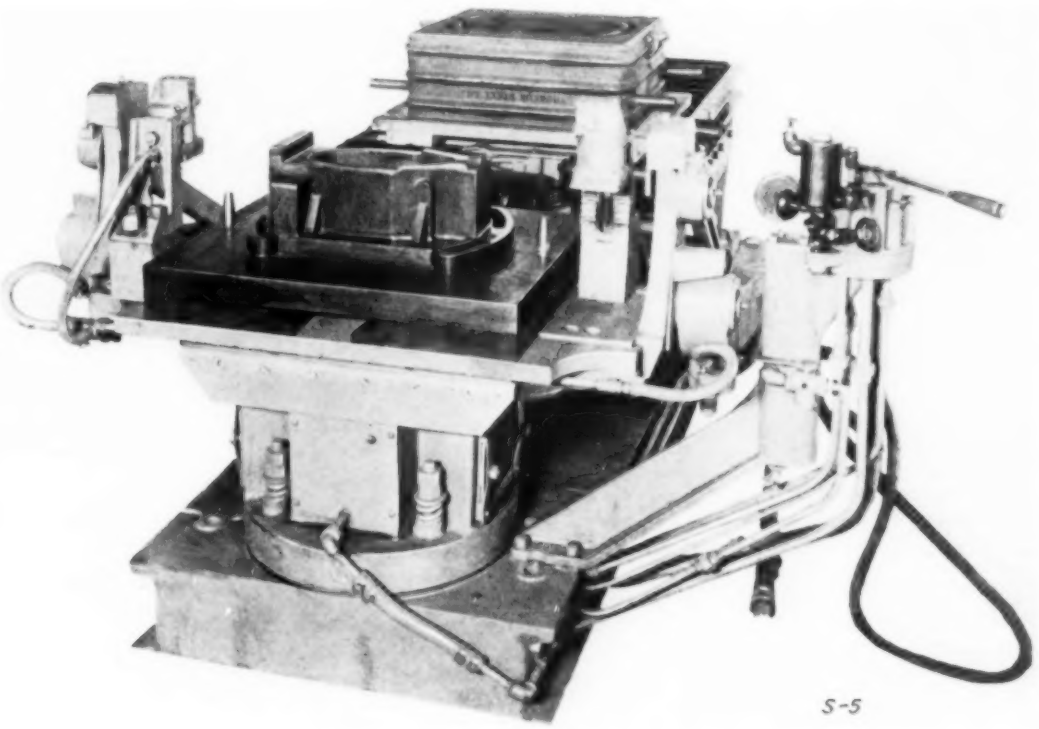
Deoxidizing Agent

A New Type of Deoxidizing Agent with Phosphorus (Neuartige Desoxydationsmittel mit Phophor), by Dr. Willi Claus, *Zeitschrift fuer die gesamte Giesserreipraxis*, Berlin, Germany, Sept. 18, 1932.

Phosphorus is well known as a deoxidizing agent in nonferrous foundries. While the element phosphorus first was used, binary alloys containing it were developed about 1860. Of these phosphor-copper containing 10 and 15 per cent phosphorus, and phosphor-tin containing 5 per cent phosphorus only find use in the foundry as deoxidizing agents. Metallurgical research has been carried on to develop cheaper base metal phosphor alloys with yellow phosphorus without much success, but recently it is claimed that by mixing red phosphorus with powdered zinc, and compressing the mixture into briquets, a suitable compound has been developed.

IF IT'S A HERMAN IT'S WORTH USING. IT MADE ITS WAY BY THE WAY IT'S MADE

HERMAN MOLDING MACHINES



S-5

During the past year Herman has made many installations in all classes of foundries.

New names have been added to the growing list of satisfied Herman users. Production has been increased and costs have been cut. Perhaps we can help you. If only the best will satisfy, why not obtain the best? Send us your molding machine problems.

HERMAN PNEUMATIC MACHINE COMPANY

GENERAL OFFICES: Union Bank Building PITTSBURGH, PA.
MANUFACTURING PLANT: ZELIENOPLE, PENNSYLVANIA, U. S. A.
Foreign Works: Pneulec Limited, Mafeking Rd., Smethwick, near Birmingham, England
Hartung Aktiengesellschaft, Berlin, Lichtenberg, Germany
Gibson Battle & Co., Limited, Sydney, N. S. W.

Obituary

MICHAEL J. KEOUGH prominently connected with the International Molders Union for over 50 years and president of the organization since 1924 died in a Cincinnati hospital Nov. 4 and was buried on the seventy third anniversary of his birth Nov. 7 in his native city, Troy, N. Y. As a boy he learned the molder's trade at the old Torrence Iron Works, Troy, and Gilbert's, Green Island. He always regarded Troy as his home and maintained a residence there for many years after his official duties had taken him to the union headquarters in Cincinnati. At the Chicago convention of the Molder's union in 1895 he was elected second vice president. Upon the death of Martin Fox in 1903 he was advanced to the position of first vice president and when Fox's successor Joseph A. Valentine retired in 1924, Mr. Keough was elected president.

William F. Huff, 56, president and general manager of the Wabash Foundry Co., Wabash, Ind., died recently.

Samuel Moore, 57, connected with Crane Co., Chicago, died at Chicago recently. He formerly was identified with the American Radiator Co., Whiting Corp. and National Dadiator Co.

Frank A. Williams, 63, who with W. J. Wallis founded the Girard Foundry & Machine Co., Girard, O., in 1890 and later moved it to Youngstown, O., as the Youngstown Foundry & Machine Co., died Nov. 21.

Arno Eberlein, 70, secretary-treasurer of the Buckeye Steel Castings Co., Columbus, O., died Nov. 16. He became an employe of the Buckeye company in 1890 and 14 years later was made secretary-treasurer.

Clyde Cox, 52, former patternmaker at the Dodge Mfg. Co., Mishawaka, Ind., and the Singer Sewing Machine Co., and South Bend Lathe Works, South Bend, Ind., and a city councilman for the past three years, died recently.

Frank H. Hinners, 72, president, George H. Smith Steel Casting Co., Milwaukee, died at his home on Nov. 22. Mr. Hinners had been a resident of Milwaukee for 60 years and was connected with the Smith company for 30 years.

Charles A. Wolff, 94, until his retirement 20 years ago a manufacturer of stoves in Cincinnati, died Nov. 10. One son, Charles F. Wolff, is secretary of the Wolff Machine Co., and another, Louis A. Wolff, is head of the Wolff Supply Co.

Thomas J. Caldwell, 73, pioneer foundryman in the Birmingham, Ala., district died recently. He began an industrial career as bookkeeper for the Shelby Iron Co. in Alabama in 1859, and opened his first machine shop in 1896. His son will continue the Caldwell Foundry & Machine Co.

Artemus W. Pickard, 62, vice president of the Bass Foundry & Machine Co., Fort Wayne, Ind., died recently at his home after a prolonged illness. Mr. Pickard had been prominent in the business development of Fort Wayne for a number of years.

Gerald E. Brownell, superintendent, grinding machine division, Norton Co., Worcester, Mass., died recently at the age of 58. He had been employed by the Norton Co. for 31 years, beginning as supervisor of installation of grinding machines. Later he became general foreman and in 1918 was appointed assistant superintendent. Two years later he was made superintendent.

Hugh David Walker, a prominent manufacturer of Grimsby, Ont., and president of the Grimsby Foundry Co. Ltd., died on Nov. 7. Mr. Walker also was managing director of Metal Craft Ltd., and president of the Steel Art Furniture Co., both of Grimsby. He took an active part in the public affairs, serving 8 years on the town council and also was one of the founders of the Grimsby chamber of commerce, serving several terms as president.

G. E. Clark, until recently foundry superintendent, D.R.C. Foundry Co., Kalamazoo, Mich., died at the home of his mother in Cleveland on Oct. 21. Mr. Clark had been connected with a number of foundries producing a variety of work during the past 15 years and previous to being employed at Kalamazoo, was foundry superintendent of the Youngstown Foundry & Machine Co., Youngstown, O., and foundry foreman of the Bean Foundry Co., Martin's Ferry, O.

Book Review

Eisen-und Stahllegierungen Patentsammlung (Iron and Steel Alloy Patent Compilation), by A. Gruetzner, paper, 7 x 10 inches, 308 pages, published by Verlag Chemie, Berlin, Germany, and supplied by THE FOUNDRY, Cleveland; in London by the Penton Publishing Co. Ltd., 416-17 Caxton House, Westminster.

This German publication comprises an appendix or suppliment to the sections on the metallurgy of iron of *Gmelin's Handbuch der Anorganischen Chemie*. It is said to list over 7000 patents relating to iron and steel alloys granted from 1880 to March, 1932 in Germany, Great Britain, United States, France, Switzerland, Austria and Poland. The patents are listed in tabular form giving the percentages of carbon, and other alloying elements; some of the properties and applications; inventor, and patent number with the country of origin. The system of tabulating is alphabetic according to the chemical symbols beginning with carbon-silver-iron alloys and ending with carbon-chromium-copper-manganese - molybdenum - nickel - silicon-titanium-zirconium alloys.

Gives Program For 1933 Congress

A tentative program for the International Foundry congress to be held at Praha, Sept. 9 to 17, 1933 under the auspices of Czechoslovak Foundry association recently was announced as follows.

Saturday, Sept. 9

Arrival of delegates in Praha, registration, membership cards, rooms and dinner.

Sunday, Sept. 10

Official opening of the congress. Sessions of the congress and lectures. Afternoon: Sightseeing tour through the city and visit in groups to some places of interest in the neighborhood of Praha (Karluv Tyn, Melnik, Podebrady). Reception by the Mayor of Praha.

Monday, Sept. 11

Forenoon: Visit of foundries and factories in Praha. Afternoon: From Praha to Moravska Ostrava by train.
Evening: Dinner in Moravska Ostrava.

Tuesday Sept. 12

Forenoon: Visit of Vitkovicke selezarny (iron and steelworks), Vitkovice. Afternoon: Visit of coke plants of "Frantisek" and "Ignat" pits. Visit of mines.

Wednesday, Sept. 13

Group One—Forenoon: Visit trip in autocars to iron and steelworks of the Banska a hutni spolecnost (Mining and Iron Co.) in Trinec.
Afternoon: return to Moravska Ostrava.
Group Two—Forenoon: From Moravska Ostrava by train to Zlin. Visit of the Bata Shoe factories.
Afternoon: Leaving Zlin for Brno.

Thursday, Sept. 14

Group One—Forenoon: From Moravska Ostrava by train via Praha to Plzen.
Group Two—Forenoon: Visit of foundries in Brno.
Afternoon: Leaving Brno for Plzen.

Friday, Sept. 15

8:00: Visit of foundry and steel plants of the Skoda-Works in Plzen.
Afternoon: Visit of the Mestansky pivovar (Citizens Brewery) in Plzen.

Saturday, Sept. 16

Forenoon: Visit of kaolin pits and West-Bohemian Kaolin and Refractory. Plant at Horni Briza.
Closing banquet.

Sunday, Sept. 17

Departure of the delegates. Arrangements can be made for trips to the famous Bohemian watering places (Karlovy Vary, Marianske Lazne, Jachymov.

Lewis S. Reid, formerly chief engineer, Magnetic Aanalysis Corp., and also metallurgical editor, *Aviation Engineering*, has joined the staff of Lucius Pitkin Inc., New York, as associate metallurgist.

Carries Cores on Conveyors

(*Concluded from page 24*)

veyor is 710 feet long and the ability of a conveyor of that length to handle the tall cores was questioned because of anticipated pulsation in a conveyor of that length and the inertia forces of turning the loaded trays around the several sprockets.

However, the operation of the conveyor has been so smooth that no cylinder core has been tipped. The conveyor has practically eliminated damage to finished cores and from that one standpoint justifies its installation.

After passing the coremakers' benches the conveyor travels upward to the maximum elevation permissible in passing through the enclosed passageway to the main foundry building, where a second upward turn is made and the conveyor passes horizontally around a stairway to permit its traveling parallel to the building wall, in a location which interferes with no foundry operation, to the first point where cores are to be removed. At that point the conveyor drops to a convenient elevation for unloading and travels horizontally along the building wall, to the far end of the foundry building, where it passes over an upward vertical curve and around a pair of sprockets, which so locate the return run of the conveyor that it passes back through the roof trusses without interfering in any way with other equipment in the plant.

Control the Speed

This return run drops, to pass through the enclosed areaway between the foundry and the core building, and at that elevation passes around the core room to the drive, after which the conveyor drops to a convenient location for receiving material from the storage racks and coremakers as outlined. The drive is provided with a variable speed transmission with hand chain for controlling the speed at which the unit operates.

No difficulty was encountered in co-ordinating the speed of the conveyor with the requirements of the core setters, and with the variable speed control they can readily accommodate the change in conveyor speed advisable to permit operating the plant at half capacity over the noon periods. There are a number of intangible savings which this trolley conveyor has effected.

Every second tray on the conveyor is provided with a shelf which may be removed. Cylinder cores are loaded upon the tray without a shelf and smaller parts upon the two shelves of the following tray. The small cores and core setter supplies are handled in metal boxes. Empty boxes are returned to the storage racks on the conveyor. Should requirements demand the use of trays without the shelf or should they require all trays to be provided with shelves, the desired changes can be made easily.

Stainless Steel Pressure Castings

(*Concluded from page 25*)

or displaced by the violent quenching treatment.

It is necessary that considerable care be given the mixing of facing sand for molds in which stainless steel is to be poured. A satisfactory facing is made with silica sand and fire clay, the latter being kept to the smallest amount that will give the necessary strength. The pattern should be covered with just sufficient facing sand to protect the mold from the cutting and burning of the metal. For example, not more than 1-inch of facing sand should be used on a mold for a 6-inch valve body. Likewise a weak core sand mixture should be used. This may be made with a fairly coarse silica sand and a good grade of core oil, mixed about 50 parts sand to one of core oil. It has been found good practice to hollow out the center of the core while in the green state, leaving about ¾-inch sand in the wall of the core.

Usually the steel foundryman is asked to use the same pattern for stainless steel valve bodies and other pressure castings that has been used for cast steel and at times he may be given a pattern that has been used for cast iron. Such a design, for example, in a 6-inch valve body will have a wall thickness of ½-inch to ⅝-inch coupled with a flange thickness of 1½ inches thus allowing for a ¼-inch finish on the face of the flange. This sets up an abrupt change in section where the body joins the flange and will lead to more trouble in stainless steel than in cast steel, owing to the greater shrinkage of the former metal.

If a gate is located so that the metal is permitted to enter a heavy section, such as directly into the flange, it will cause a crack where the flange joins the body opposite the point of entrance of the metal. This results from the point being of a heavier section and because it is kept hot by incoming metal, is the last to cool and therefore it will pull apart. A better method is to gate directly into the body of the mold and not into the flange. The type of gate is known as a knife gate and the metal enters the mold and is divided into two streams each one being approximately ⅜-inch wide and ½-inch high. It has been found that this gate will set as soon as the rest of the casting and thus prevent a hot spot.

The various steps in the production of a 6-inch valve body are as follows:

Ram the drag, covering the pattern with not more than 1-inch of facing sand. To weaken the backing sand add one part of new sand to three parts of heap sand. Some prefer to use sawdust with the backing sand. In ramming the cope provide boards 1¼ inch thick and as wide as the flange, cut at the end to conform to the shape of the body of the pattern. Place one board back of each flange, its end within 1-inch of the pattern and approximately 1-inch from the flange. Have each board extend 4 inches above the top of the flask to facilitate removal.

Place a riser 3 inches thick and 6 inches wide by approximately 4 inches high on each flange. Gate into the body at the joint midway between flanges with a knife gate as previously described. Wash the mold, including risers, with a thin coat of closely adherent silica wash. Dry the mold in an oven at 700 degrees Fahr.

Make the inner core as previously described, baking to a dark brown in a well ventilated oven at 400 degrees Fahr. Leave both the mold and the core in the hot ovens until just before it is time to pour. Remove the mold from the oven and set the core without the use of chaplets, if possible. Then close the mold and clamp securely.

Just as soon as poured, knock out the shrink boards as previously indicated. When the casting is cool, shake out and sandblast. Remove the risers with an electric arc, then chip and grind. Heat the casting slowly and uniformly to 2100 degrees Fahr. When all parts of the casting have reached the required temperature, quench promptly in warm water. The casting now is a dark brown or nearly black color. It is best to subject it to a pressure test at this stage as any leak will be much easier to detect than if tested after pickling, as the latter treatment removes the dark surface discoloration, restoring its natural silvery color and thus making it more difficult to detect a leak.

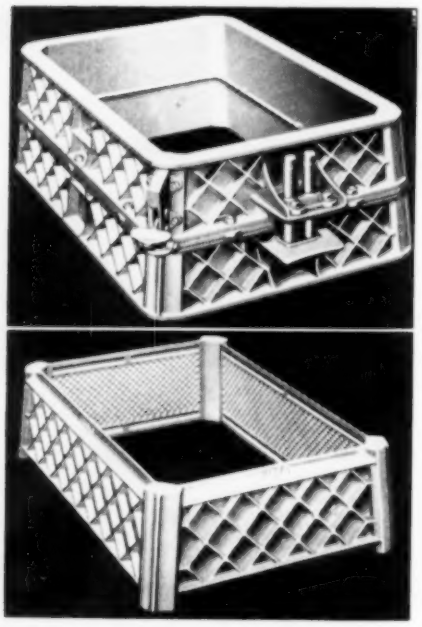
If the casting does not leak on the pressure test it is sent to the pickling tank. The first tank contains a moderately strong solution of hydrochloric acid and sulphuric acid. After several hours action, depending upon the strength of the solution, the casting is removed and washed with water. It is then placed in the second tank containing a dilute solution of nitric acid. A short time in this solution usually is sufficient. Remove the casting and wash with water. A final sandblast usually is given the casting before shipment.

New Equipment

For Foundries

Interchangeability Features New Flasks

Hines Mfg. Co., 10106 Detroit avenue, Cleveland, recently has developed a new line of aluminum slip



The new flask is shown above and the jacket below

flasks and jackets which incorporate numerous interesting features. Corners are filled to provide clean flasks and to permit the flasks to be taken from the molds without the use of a mallet. Pins are counter bored into a malleable iron chill which is cast into the lugs of the flask. This construction is designed to provide rigid, upright pins which will be at right angles with the joint of the flask at all times.

A continuous sand strip is operated with an entirely new device constructed without springs or complicated mechanism. The operating levers, located on two opposite corners of the flask, also are designed to prevent sand from entering the strip operating mechanism. The cross ribbed design on the sides of the flask, as shown in the accompanying illustration, has been introduced to decrease the weight and at the same time provide ample strength.

All flasks, jackets and all fixtures are built on jigs and are interchangeable. Extension frames 1-inch high and up are built in aluminum for each size flask, and are designed to provide a perfect extension of the taper of the flask. In addition, the dimensions of the bottom of one size of flask are exactly the same as the top of the cope of the next larger size, so that two or more flasks may be attached if desired.

Jackets are made either of aluminum or gray iron and the inside surface is corrugated to release the gas easily. It is claimed that this construction also assists in shedding the melted iron without damage to the jacket.

Gasoline Driven Arc Welder Is Portable

Harnischfeger Corp., 4404 West National avenue, Milwaukee, recently has introduced a portable, gasoline driven arc welder. The unit has a capacity of 300 amperes and is driven by a 42 horsepower gasoline engine which runs at 1740 revolutons per minute.

A flexible coupling joins the welding generator to the gas engine. The generator is equipped with a panel board containing flush type volt meter and ammeter and cable terminal studs with large hand screw clamps. A single and easily operated control for regulating the welding current is mounted on the commutator end of the generator.

May Use Magnet On Tractor Type Crane

The crane and tractor unit, recently introduced by the Bucyrus-Erie Co., South Milwaukee, Wis., and described in the September issue of THE FOUNDRY now may be obtained with a 20-inch electric magnet. It is pointed out this magnet equipment makes the machine useful in handling scrap iron, small castings and other material which ordinarily require considerable time for hooking.

Makes Changes in Design of Conveyor

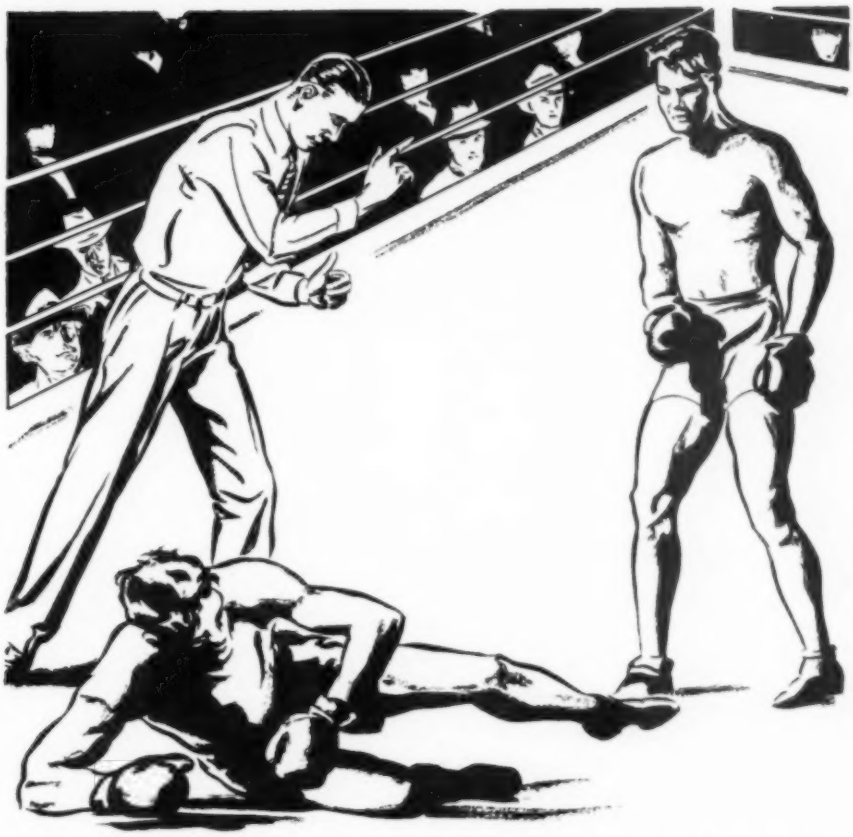
Link-Belt Co., Philadelphia, recently introduced a portable belt conveyor embodying numerous changes in design over the previous model. Among other features it incorporates fixed steel retaining sides extending the entire length of the

Steel retaining sides extend the length of the conveyor

conveyor, thus preventing lumps from spilling over the sides of the belt at any point. The foot end has been changed to keep material away from the return run of the conveyor belt. Another feature is the new arrangement of the foot end plate, permitting the use of the machine without this plate, when desired, minimizing labor in feeding, and serving to speed up loading.

The conveyor is 21 feet long, 18 or 24 inches wide and is monuted on a substantial channel frame with full-length cover over return run of belt. The discharge height is regulated through a spur geared hand crank by winding a cable on or off a drum. A steel pawl holds the conveyor in position. Forced lubrication is used throughout. A view of one of the units is shown in the accompanying illustration. The machine is suitable for loading or unloading any loose material, and various modifications are possible.

The champ was down . . . to thousands of shrieking, wild fans, it looked like the finish. But the champ got up . . . and won!



Maybe You're Down . . . NOW

But Get Up and FIGHT!

IT takes a good man to get up from the floor and win the fight . . . but many good men have done it! And you can't start any sooner than now to fight . . . continuously, relentlessly . . . to reduce your melting costs to the irreducible minimum, to attain the economy that is essential if you are to compete for business in the future.

Your fight for lowest melting costs will be a winning one if you begin the battle with crucible-melting equipment. It keeps your initial furnace investment at the minimum, and involves only the lowest carrying charges, lowest depreciation.

You have the lowest operating costs with crucible equipment. You can use whatever solid, liquid or gaseous fuel is most economical for you. Your crucible furnaces do not run up fuel bills when they are not operating. You can run your crucible furnaces as you need metal hourly or daily; wasteful, continuous operation is unnecessary. And, as you well know, your crucible furnaces cannot be excelled in output of quality metal per operator and per unit.

Fight . . . and win . . . your battle for lowest melting costs with crucible equipment. Get your existing crucible furnaces in shape for most efficient, economical operation. Before you buy a new furnace, be sure you have the complete facts on crucible-melting economy. Ask any of the following companies:

Joseph Dixon Crucible Co., *Jersey City, N. J.*
Lava Crucible Co. of Pittsburgh, *Pittsburgh, Pa.*
Chicago-Naugatuck Crucible Co., *Shelton, Conn.*
Ross-Tacony Crucible Co., *Tacony, Phila., Pa.*
Vesuvius Crucible Co., *Swissvale, Pa.*

Remember! ONLY

PLUMBAGO (GRAPHITE)

CRUCIBLE-MELTING

Gives Crucible Quality, Flexibility, Adaptability, Reliability and Economy

Furnace Designed For Small Production

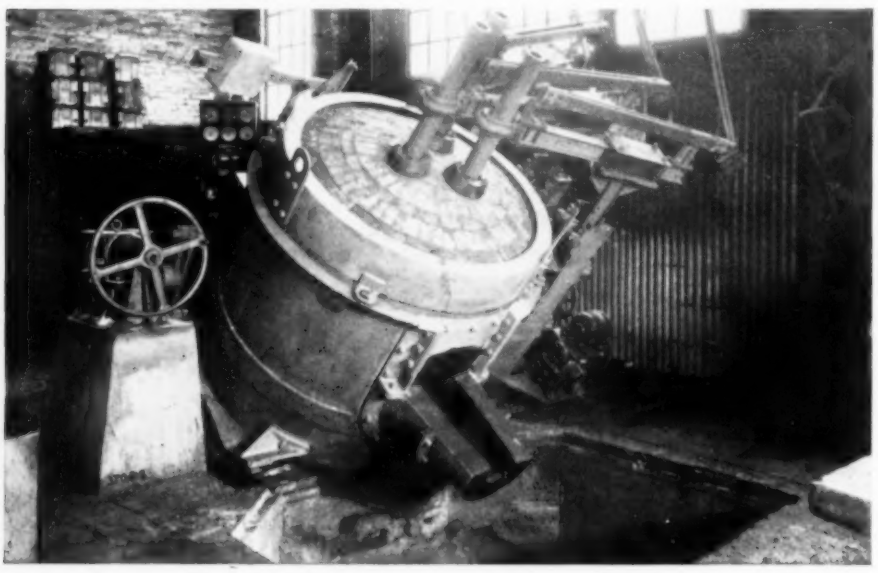
A Heroult type, three-phase electric melting furnace has been designed by Samuel Arnold 3rd, Pittsburgh, primarily for use as a bleeder type furnace. When employed in that manner the furnace is connected to transformers available with larger units. However, it also can be equipped with its own transformer and control apparatus and operated as an individual furnace. The furnace may be lined with either acid or basic refractories. It is pointed out that at periods of low production, the unit will provide sufficient ferrous metal for normal requirements, but at a low power demand charge.

The furnace is equipped completely for automatic power control, and each of the electrodes has a separate electric motor operating through spur gears and a worm gear. The worm shafts are extended for the attachment of hand wheels for manual operation when required. Special high conductivity copper wedge type electrode holders are used which are extremely rugged and simple in design. With normal operation it usually is not necessary to water cool the holders, but cooling pipes are provided so that water may be used if desired. The current to the electrodes is carried over the top of the mast, the bus bars being mounted on nonferrous castings to eliminate eddy current and hysteresis losses and also to increase the efficiency.

Additional features include a heavy steel plate shell reinforced with steel castings, a water cooled charging frame and arch and insulation at the masts instead of at the electrode holders.

The tilting gear is of the crank type which provides safety in tilting the furnace since the forward motion is limited by the crank and continuous operation of the crank simply will oscillate the furnace backward and forward. The worm gear for the electrode and the tilting gear were supplied by the De Laval Steam Turbine Co., Trenton, N. J.

If it is desired to operate the furnace as an individual unit, a transformer, regulator and switchboard are necessary. With the improved type electrical equipment including motor operated tap changers built into the transformer, the unit is well adapted for small production.



The furnace may be connected to transformers available with larger units or operated individually

Circuit Breakers For Industrial Uses

A new line of manually and electrically operated air circuit breakers recently developed by the General Electric Co., Schenectady, N. Y., has a field of application in the control and protection of apparatus and feeders in buildings, industrial work and power stations. The breakers are rated up to 750 volts, 10,000 amperes and are made in single, double and four-pole arrangements. The breakers are trip free. They can be equipped with instantaneous or time overcurrent trip, instantaneous or time undervoltage trip, shunt trip, and auxiliary switches. The overcurrent mechanism is constructed for direct tripping action on breakers of all ratings.

Peden Machinery Co., Cleveland, has been appointed distributor of the Chain Belt Co., Milwaukee, in the Cleveland territory for its line of mixers, pumps and other construction equipment.

Hoist Operates With Low Headroom

Philadelphia Gear Works, Philadelphia, has added to its line a new electric hoist, built in sizes from ½ ton to 3 tons, inclusive. The hoist, shown in the accompanying illustration, has features including high lift with low headroom; noiseless operation; no load brake necessary, balanced so that load is always under exact center of rail; hoist swivel trolleys turn on 4-foot radius; operating mechanism sealed against oil, dirt and oil-leakage; heavy-duty construction and interchangeability of parts.

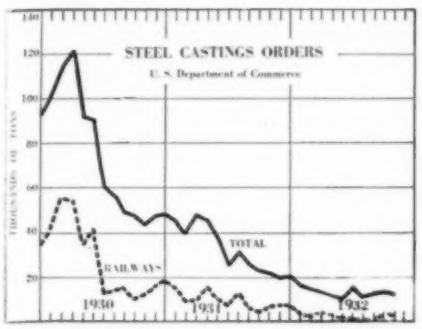
The hoist is push button controlled

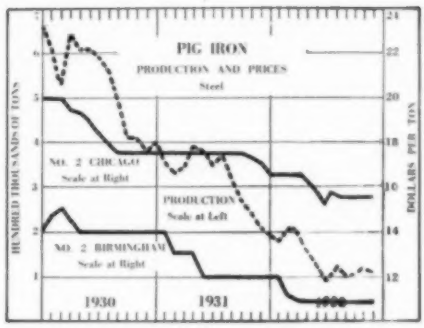
Standard electric motors are used and the hoist is push button controlled. Hook swivels are ball bearing equipped. The cable drums are of large diameter with accurately machined grooves. Hardened steel trolley wheels with ball bearings, alloy-steel heat treated helical gears and hardened and ground thread worms, automatic upper limit hook stop, and positive oil-bath lubrication are among the other featurs.

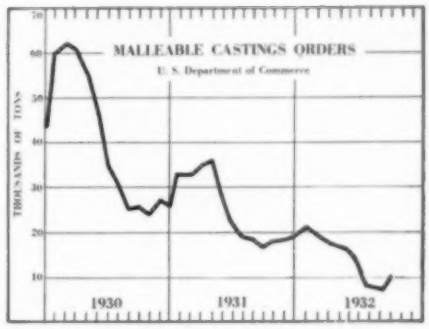
Box Provides Several Changes of Speed

General Radial Drill Co., 1765 Elmore street, Cincinnati, has developed a line of multi-speed change boxes using a V-disk transmission. Features claimed for the unit include high efficiency, long life and low up-keep costs. Eight speed changes may be secured up to ratios of 9 to 1. An idler disk sets up a wedging action in direct proportion to the load it transmits. Speed changes are made by a star knob located on top of the unit.

The grooved cones are of steel and are mounted on steel shafts supported by ball bearings. The composition disk runs as an idler between the cones and is the only part to wear, excepting the ball bearings.







Foundry Activities

Reflect Industrial Trends

FAITH MFG. CO., 5920 North Crawford avenue, Chicago has purchased part of the property of the Tallman Brass & Metal Co., Hamilton, Ont., Canada, and has organized the Faith Mfg. Co. of Canada Ltd. to manufacture the complete line of automobile accessories, die castings and other products made by the company and also to do outside plating and polishing work.

* * *

Hetzler Foundry Inc., has been organized at Rochester, N. Y., by Geo. A. Hetzler and Herman Hetzler.

* * *

Reuter Bros. Iron Works Inc., 5820 South Wood street, Chicago, has been organized to manufacture iron and bronze castings.

* * *

Floyd & Phillips Machine Co., 418 Second street, Portsmouth, O., will install a brass and aluminum foundry.

* * *

B. Bowater has taken over the interest of Arthur Nelson in the North Chicago Pattern & Machine Co., 112-114 Morrow avenue North Chicago.

* * *

Richmond Structural Steel Co., recently organized at Richmond, Va., will manufacture gray iron, brass, and bronze castings, structural steel and ornamental iron.

* * *

New England Manufacturers' Foundry Inc., Agawam, Mass. has been organized by Herman A. Mintz, State street, Boston to operate a foundry.

* * *

Patterson Foundry & Machine Co. East Liverpool, O., plans to enter the heating field about Jan. 1 with a line of conditioned air heating systems, air conditioners, oil burners, domestic stokers and gas-fired equipment for all types and sizes of heaters.

* * *

Stevenson Brass Foundry & Machine Works, Ponca City, Okla. has been established at 112 North Union street, by J. W. Stevenson, owner.

* * *

Report of the Gray Iron institute shows production of member companies registering an increase for the third successive month in October. Production was 40.9 per cent of normal compared with 39.2 per cent in September and 47.6 per cent in October, 1931. A slight decline in new business and unfilled orders is shown.

* * *

Furnace Parts & Foundry Co. Cleveland has been incorporated with $1000 capital, by H. H. Webster, 1019 Williamson building, Cleveland.

* * *

John Peters, Rice Lake, Wis., has reopened the foundry of the Rice Lake Iron Works, closed for more than 2 years, and will do a general jobbing and repair business.

* * *

Ferguson & Lange Foundries, Inc., 1039 Willow street, has been organized by Louis Weckerley and Ray M. Northrup to manufacture iron and other metal castings.

* * *

Up-to-date Pattern & Foundry Corp. Los Angeles has moved to larger quarters at 2444 East Eighth street and will enlarge its production of snap flasks, aluminum, brass, bronze and copper castings.

* * *

Increased activity in malleable iron and steel foundries in the Philadelphia districts was reported during October by the Industrial Research department, University of Pennsylvania.

* * *

International Harvester Co., Chicago, has announced a plan for increasing employment during the winter and early spring months. The company proposes to put to work gradually a total of about 4000 part-time employes above the forces now working in various factories throughout the country. The announce-

RAW MATERIAL PRICES

Dec. 5, 1932

Iron	
No. 2 foundry, Valley	$14.50
No. 2 Southern, Birmingham	11.00
No. 2 foundry, Chicago	15.50
No. 2 foundry, Buffalo	16.00
Basic, Buffalo	15.50 to 16.00
Basic, Valley	14.00
Malleable, Chicago	15.50
Malleable, Buffalo	16.50
Coke	
Connellsville beehive coke	$2.50 to 4.25
Wise county beehive coke	4.25 to 5.00
Detroit by-product coke	8.00
Scrap	
Heavy melting steel, Valley	$8.75 to 9.25
Heavy melting steel, Pitts.	8.75 to 9.25
Heavy melting steel, Chicago	5.00 to 6.00
Stove plate, Buffalo	7.75 to 8.00
Stove plate, Chicago	5.75 to 6.25
No. 1 cast, New York	6.00 to 6.50
No. 1 cast, Chicago	6.00 to 6.50
No. 1 cast, Pittsburgh	9.00 to 9.50
No. 1 cast, Philadelphia	9.00 to 10.00
No. 1 cast, Birmingham	9.00 to 9.50
Car wheels, iron, Pittsburgh	9.00 to 9.50
Car wheels, iron, Chicago	9.00 to 9.50
Railroad malleable, Chicago	6.00 to 6.50
Agricultural mal., Chicago	5.00 to 5.50
Malleable, Buffalo	8.00 to 8.50
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	4.87½ to 5.00
Straits tin	22.50
Aluminum, No. 12, producers	22.00
Aluminum, No. 12 remelt Cleveland	8.00 to 9.00
Lead, New York	3.00
Antimony, New York	5.50 to 5.60
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.12½

ment was made by Vice President George A. Ranney.

* * *

Advance Pressure Castings Inc., 34-48 North 15th street, Brooklyn, N. Y., has appointed the following representatives. F. X. Morris, 448 Irvington road, Drexel Park, Delaware county, Pa.; L. E. & L. Sales Engineers, 212 Humber building, Highland Park, Mich.; W. R. McDonough & Co., National building, Cleveland; B. J. Steelman, 224 South Michigan avenue, Chicago; and A. C. Werner, 5522 South 37th street, St. Louis.

New Trade Publications

BLAST NOZZLES—Long life abrasive blast nozzles are described in a recent bulletin of the American Foundry Equipment Co., Mishawaka, Ind. It is pointed out in the bulletin that the type of nozzle described usually lasts from 300 to 500 hours of steady use. The nozzle has an alloy liner or core which is claimed to have practically diamond hardness, with a high resistance to abrasive wear. Adaptors are supplied where necessary or when preferred, a screw-thread type nozzle can be supplied.

LOCK-NUT—A folder of the Cadillac Bolt & Nut Co., Cadillac, Mich., describes and illustrates a lock-nut of certified malleable iron.

CAST STEEL—West Steel Casting Co., 805 East Seventieth street, Cleveland, has issued a bulletin on the advantages of steel castings from its foundry for strength, economy and durability.

CLAMPS — Carson-Cadillac Corp., Cadillac, Mich., describes its bell joint clamps for cast iron pipe in a recent bulletin. Rigidity, simplicity and adaptability are features claimed for the clamp.

HOIST MOTORS — General Electric Co., Schenectady, N. Y., has published bulletin GEA-1366 describing a small alternating current hoist motor. The units are provided with rating from 1½ to 15 horsepower and operate at standard speeds.

WEIGHT RECORDER—A comparison of costs between hand weighing and automatic motion weighing is presented in a recent bulletin of the Streeter-Amet Co., 4101 Ravenswood avenue, Chicago. The equipment described may be attached to any scale levers now installed and properly operated.

WELDING ELECTRODES — The General Electric Co., Schenectady, N. Y., in bulletin GEA-1546A describes and illustrates its line of welding electrodes and accessories. Accessories include welding helmets, welding table, electrode holders, etc.

SAFE—A cast safe having 900 cubic inches of storage space is illustrated in a recent bulletin of the Gunite Foundries Corp., Rockford, Ill. The safe, which is said to be constructed of a material which cannot be drilled, broken or crushed, is designed to be installed in a wall, floor or square of concrete.

REFRACTORY CEMENT — Charles Taylor Sons Co., Cincinnati, has published a bulletin discussing briefly the uses of its refractory cement in laying fire brick in a number of industrial furnaces. The cement may be used for trowelled joints, dipped joints, wash coatings and patching.

LOCOMOTIVE—Gasoline driven industrial locomotives are discussed in bulletin B-29 recently published by the Brookville Locomotive Co., Brookville, Pa. Information given includes a description of the power plant, general specifications of the unit, and data on how to figure haulage capacity.

TURBO-BLOWERS — Allis-Chalmers Mfg. Co., Milwaukee, in bulletin 1903 illustrates and describes the construction and operating characteristics of its line of turbo-blowers. Included in the uses listed for the unit is that of blowing foundry cupolas.

LIGHTING EQUIPMENT—A 64-page catalog, No. 219-A, has been published by the Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, illustrating various type of lighting equipment developed for industrial applications. The procedure to be followed in designing industrial lighting systems also is presented in the publication.

RUBBER PRODUCTS—B. F. Goodrich Rubber Co., Akron, O., recently has published a new, condensed catalog giving a simplified, comprehensive line-up of principal industrial rubber goods and containing engineering information and data never before published. The title of the catalog is "Engineering Data, Industrial Rubber Goods."

MIXERS—Lancaster Iron Works Inc., Lancaster, Pa., has published a bulletin describing the mechanical features and operation of a counter-current mixer designed to handle a variety of materials. Various sizes and types of machines are illustrated and diagrams show the movements of roller blade during one revolution of the pan.

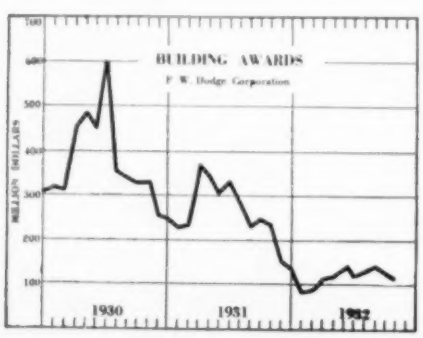
PUMPS — "Priming Centrifugal Pumps" is the subject of a recent bulletin 21-B22 published by Roots-Connersville-Wilbraham, Connersville, Ind. Information presented pertains to rotary positive blowers and vacuum pumps for exhausting air from suction pipe and casing of large centrifugal pumps.

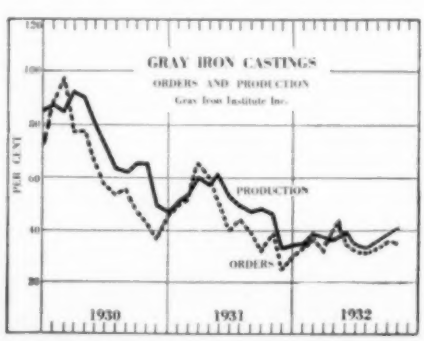
LIFTING MAGNETS—Electric Controller & Mfg. Co., Cleveland, has published bulletin 900 devoted to a discussion of the design and application of its line of lifting magnets. Illustrations include several pertaining to foundry operation, such as charging the cupola, handling pig iron, making up charges, and handling scrap.

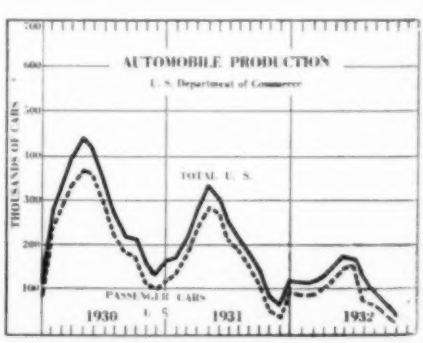
SUGGESTION SYSTEMS—"Employees' Suggestion Systems" is the subject of a booklet recently issued by the Policyholders Service bureau, Metropolitan Life Insurance Co., New York. The publication discusses methods used by representative industrial companies to obtain worthwhile suggestions from their personnel. The report is based on a study of systems of more than 100 organizations and describes outstanding features of the various plans.

Faked Foundry Facts

Slip Over







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HOUSTON, Texas—W. P. Cunningham, 910 Rice St.
PITTSBURGH, Pa.—McKee-Oliver Inc., 1326 West Carson St.
ATLANTA, Ga.—C. W. Moore, 991 Blue Ridge Ave.
NORFOLK, Va.—R. E. Murray & Co., 700 Front St.
SEATTLE, Wash.—M. M. Mosman, 2712—4th Ave. S.
DETROIT, Mich.—Moltrup Steel Products Co., 806 Fisher Bldg.
BUFFALO, N. Y.—N. D. Tilbury, 307 White Bldg.

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DAYTON, Ohio—Central Steel & Wire Co., E. Monument Ave., Ext'd
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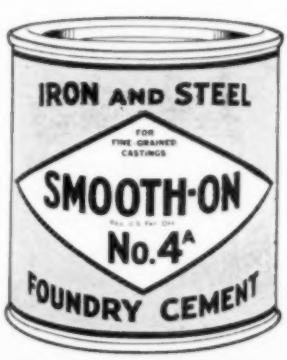

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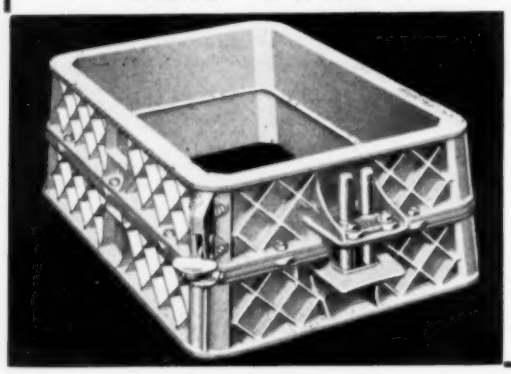

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Perfect alignment
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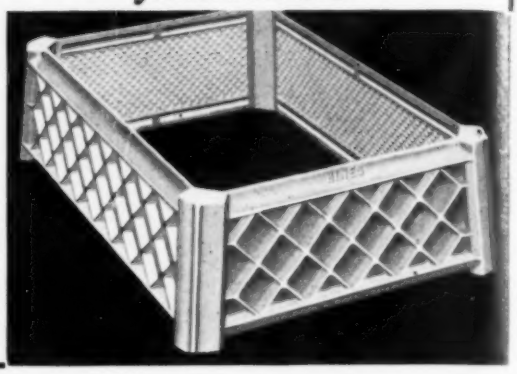

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Cuts Cleaning Costs!

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One ton of Globe shot in most cases will convince you that shot-blasting is the low-cost way to clean castings, whether grey iron, malleable or steel.

Write us for samples and data that *shows* you why Globe Shot will save you money.

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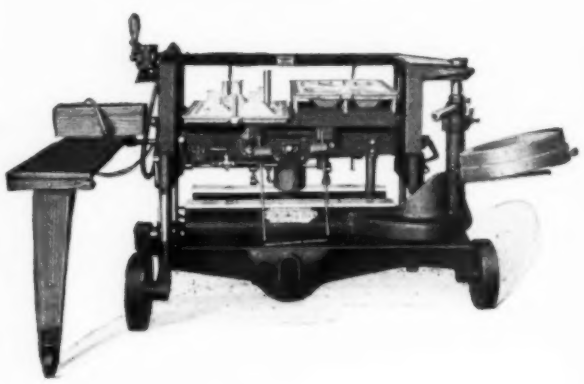

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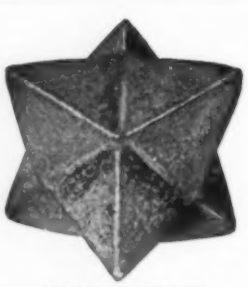

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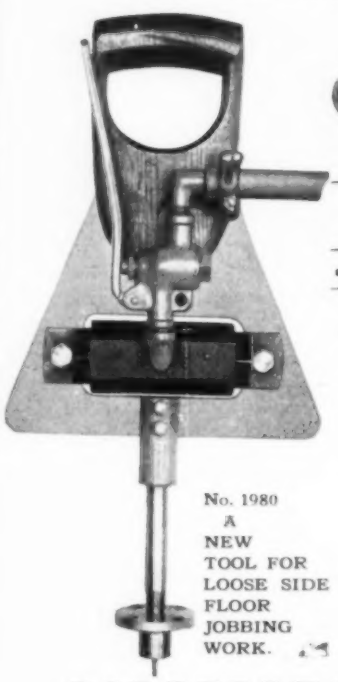

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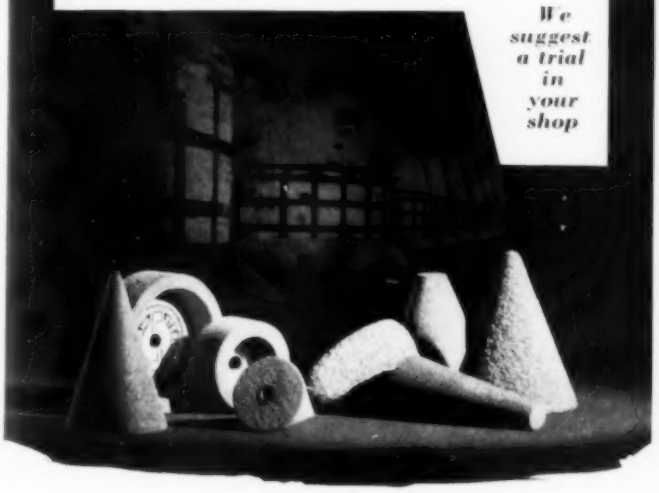

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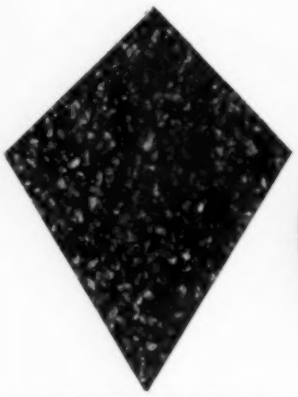
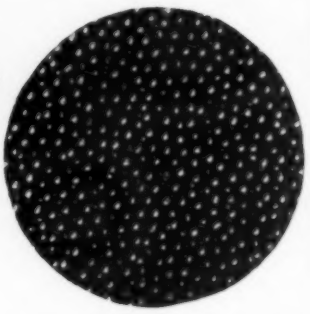
AMERICAN
CHILLED STEEL ABRASIVES





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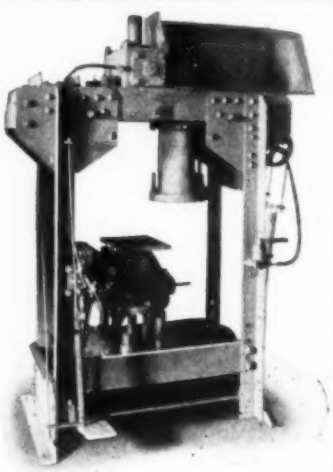

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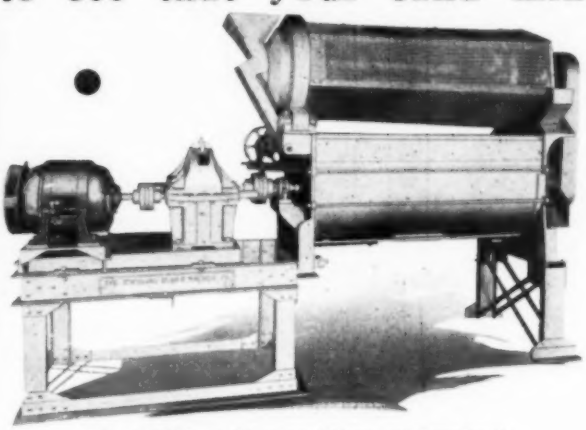

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Foundrymen's Handbook

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Section I.	General Foundry Data	Section IV.	Nonferrous Metals and Alloys
Section II.	Computing Weights		
Section III.	Reference for Pattern Makers	Section V.	Specifications
		Section VI.	Miscellaneous Tables

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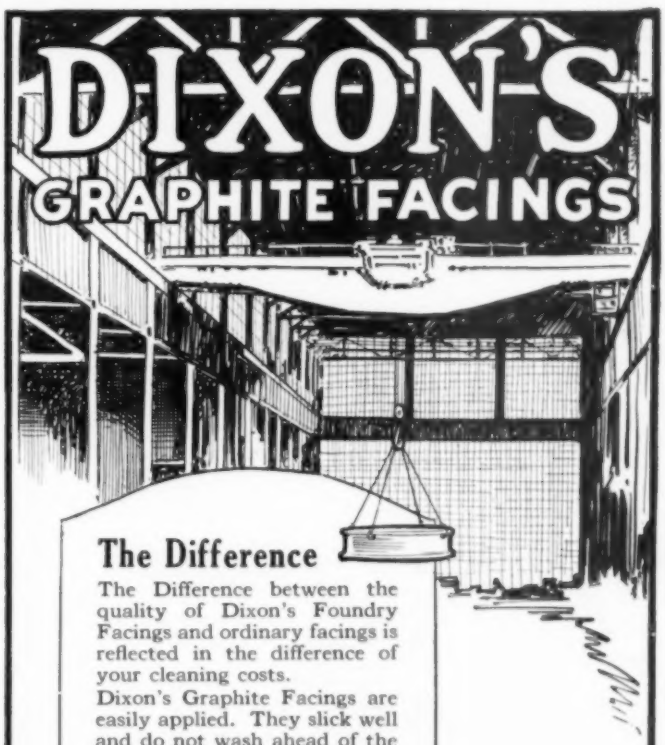

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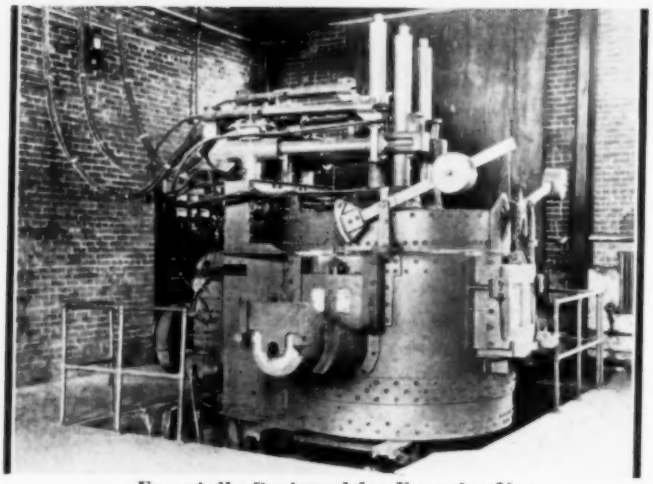

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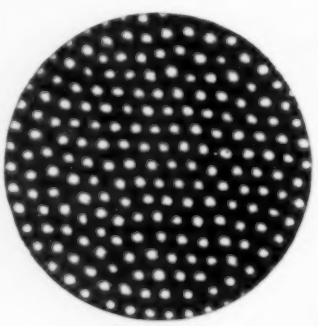

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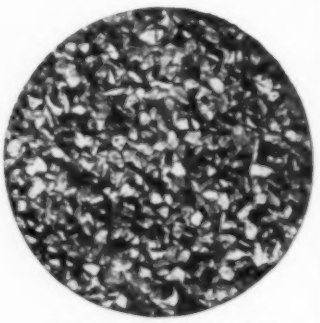

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